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PROGRESSIVE MENTAL ARITHMETIC

JOHN B. GIFFORD

BOOK TWO

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THE PROGRESSIVE MENTAL ARITHMETIC

BOOK II

BY

JOHN B. GIFFORD

AUTHOR OF "ELEMENTARY LESSONS IN PHYSICS"

THOMPSON BROWN COMPANY
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PREFACE

In his school work the author has felt the want of available exercises in mental arithmetic which would make for power to deal off hand with number problems such as are met with out of school. Conference with other school workers has shown that this feeling is shared by many. The Progressive Mental Arithmetic is the result of an effort to meet this need.

The aim has been:

To develop topics from the thought side.

So far as practicable, to use problems such as arise in the experiences of daily life.

To dwell upon new principles long enough for the pupil to grasp them, and to use them in subsequent exercises at such intervals as would enable him to retain them.

To grade the work to the expanding powers of the children.

To furnish extra work for the pupil who is able to do it.

Book II reviews and extends the work of Book I. It includes further applications of percentage, the measurement of more difficult surfaces and solids, longitude and time, powers and roots, and ratio and the relations of similar surfaces and similar solids.

The author wishes to acknowledge his debt to the teachers in a number of cities and towns who have tested these exercises with their classes, and to others, including Arthur L. Gould, Sub-Master, Martin School, Boston; and George I. Aldrich, Superintendent of Schools, Brookline, Mass., who have read the manuscript critically and made valuable suggestions for improving it.

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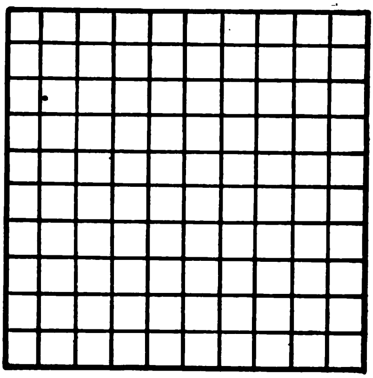
PROGRESSIVE MENTAL ARITHMETIC

BOOK II

Write No Answers in This Book

I. PERCENTAGE

Work independently, and write all answers in ink.



1. One of the small squares at the right is what part of the large square? What per cent of it?

2. Five of them are what per cent? Seven of them?

3. A row of small squares equals what per cent?

4. Two rows equal what part? What per cent?

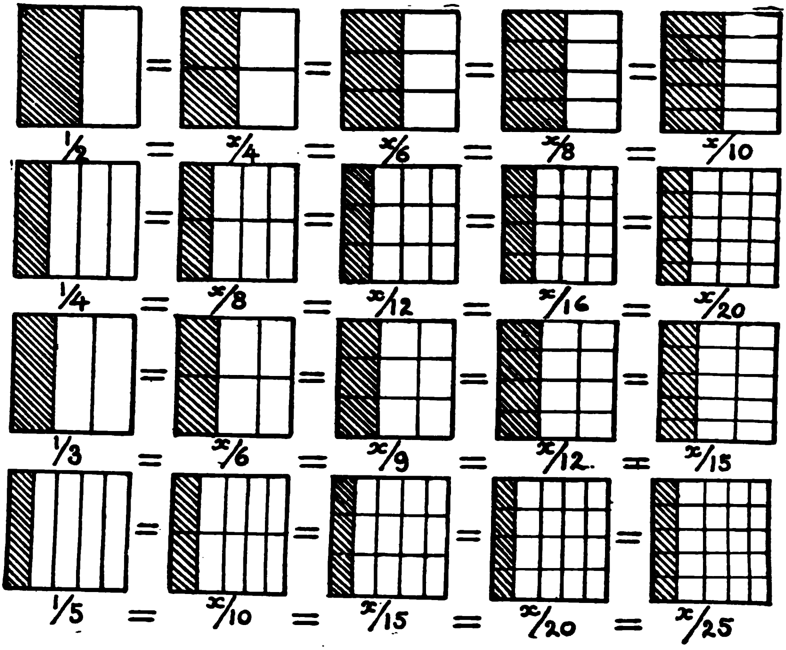
5. Four rows? Six rows? Eight rows?

6. Two and a half rows? Seven and a half rows?

7. Seven correct answers out of 10 is what per cent correct?

The following method of examining the work on each exercise is suggested.
One pupil read his answers.
Others check their correct answers.
Decide what per cent 1 correct answer is of the whole.
Each decide what per cent his correct answers are of the whole.

II. DIVIDED HALVES — THIRDS — FOURTHS — FIFTHS


1/2 = x/4 = x/6 = x/8 = x/10
1/4 = x/8 = x/12 = x/16 = x/20
1/3 = x/6 = x/9 = x/12 = x/15
1/5 = x/10 = x/15 = x/20 = x/25

Think these exercises with the eyes upon the squares.

1. $\frac{1}{2} = \frac{x}{4}, \frac{x}{6}, \frac{x}{8}, \frac{x}{10}, \frac{x}{12}, \frac{x}{14}, \frac{x}{16}, \frac{x}{18}, \frac{x}{20}, \frac{x}{24}, \frac{x}{28}, \frac{x}{32}, \frac{x}{50}, \frac{x}{100}$

x means the number to be found.

2. $\frac{1}{4} = \frac{x}{8}, \frac{x}{12}, \frac{x}{16}, \frac{x}{20}, \frac{x}{24}, \frac{x}{28}, \frac{x}{32}, \frac{x}{36}, \frac{x}{40} \cdots \frac{x}{48} \cdots \frac{x}{64} \cdots \frac{x}{80} \cdots \frac{x}{100}$

3. $\frac{1}{3} = \frac{x}{6}, \frac{x}{9}, \frac{x}{12}, \frac{x}{15}, \frac{x}{18}, \frac{x}{21}, \frac{x}{24}, \frac{x}{27}, \frac{x}{30}, \frac{x}{33}, \frac{x}{36} \cdots \frac{x}{48} \cdots \frac{x}{75}$

4. $\frac{1}{5} = \frac{x}{10}, \frac{x}{15}, \frac{x}{20}, \frac{x}{25}, \frac{x}{30}, \frac{x}{35}, \frac{x}{40}, \frac{x}{45}, \frac{x}{50} \cdots \frac{x}{60} \cdots \frac{x}{75} \cdots \frac{x}{100}$

5. $\frac{1}{2}$ of $\frac{1}{2} = x$, $\frac{1}{3}$ of $\frac{1}{2} = x$, $\frac{2}{3}$ of $\frac{1}{2} = x$, $\frac{2}{5}$ of $\frac{1}{2} = x$.

6. $\frac{1}{2}$ of $\frac{1}{4} = x$, $\frac{1}{2}$ of $\frac{3}{4} = x$, $\frac{1}{3}$ of $\frac{1}{4} = x$, $\frac{2}{3}$ of $\frac{1}{4} = x$.

7. $\frac{1}{2}$ of $\frac{1}{3} = x$, $\frac{1}{3}$ of $\frac{1}{3} = x$, $\frac{1}{3}$ of $\frac{2}{3} = x$, $\frac{1}{4}$ of $\frac{1}{3} = x$.

8. $\frac{1}{2}$ of $\frac{1}{5} = x$, $\frac{1}{2}$ of $\frac{3}{5} = x$, $\frac{1}{3}$ of $\frac{1}{5} = x$, $\frac{2}{3}$ of $\frac{1}{5} = x$.

9. $\frac{1}{4}$ of $\frac{1}{5} = x$, $\frac{3}{4}$ of $\frac{1}{5} = x$, $\frac{1}{4}$ of $\frac{3}{5} = x$, $\frac{3}{4}$ of $\frac{3}{5} = x$.

III. FRACTIONS — ADDITION — SUBTRACTION

Like Parts — Common Denominator

1. Think through 1–4 in the last exercise until you can give the changes without hesitating.

2. Are 2-thirds and 3-fourths like parts, or different parts? Are 2-fifths and 3-fifths like parts?

3. What are the largest like-parts into which halves and thirds can be divided? (See squares in last lesson.)

4. $\frac{1}{2} = \frac{x}{6}$, $\frac{1}{3} = \frac{x}{6}$, $\frac{2}{3} = \frac{x}{6}$

5. $\frac{1}{2} + \frac{1}{3} = x$, $\frac{2}{3} - \frac{1}{2} = x$, $\frac{1}{2} + \frac{2}{3} = x$, $\frac{1}{3}$ of $\frac{1}{2} = x$

In adding and subtracting fractions of unlike parts, first change them to equivalent fractions having like parts.

6. $\frac{3}{4} = \frac{x}{8}, \frac{x}{12}, \frac{x}{16}, \frac{x}{20}, \frac{x}{24}, \frac{x}{28}, \frac{x}{32}, \frac{x}{36}, \frac{x}{40}, \frac{x}{48}, \frac{x}{64}, \frac{x}{100}$

7. $\frac{3}{4} + \frac{1}{3} = x$, $\frac{3}{4} - \frac{1}{3} = x$, $\frac{3}{4} + \frac{2}{3} = x$, $\frac{3}{4} - \frac{2}{3} = x$.

What are the largest like parts into which thirds and fourths can be divided?

8. $\frac{1}{2} = \frac{x}{10}$, $\frac{1}{5} = \frac{x}{10}$, $\frac{2}{5} = \frac{x}{10}$, $\frac{7}{10} - \frac{2}{5} = x$, $\frac{1}{2} - \frac{2}{5} = x$

9. $\frac{1}{3} = \frac{x}{15}$, $\frac{2}{3} = \frac{x}{15}$, $\frac{1}{5} = \frac{x}{15}$, $\frac{2}{5} = \frac{x}{15}$, $\frac{4}{5} = \frac{x}{15}$

10. $\frac{1}{3} + \frac{1}{5} = x$, $\frac{1}{3} - \frac{1}{5} = x$, $\frac{3}{5} + \frac{1}{3} = x$, $\frac{3}{5} - \frac{1}{3} = x$.

11. Find the distance round a field $\frac{1}{4}$ mi. by $\frac{1}{8}$ mi.

12. How do denominators of fractions made up of like parts compare? **Such fractions are said to have a common denominator.**

Exercises lettered *a, b, c,* etc. are intended for the more rapid workers.

a. A owns $\frac{1}{4}$ interest in a large orchard, and C owns $\frac{2}{3}$. Together they own what part?

b. The orchard is $\frac{3}{4}$ mi. long and $\frac{1}{2}$ mi. wide. How many miles of fence are required to inclose it?

IV. MULTIPLICATION — DIVISION — FIFTEENS

1. Beginning with 15, write the counts by 15's to 180, and backward to 15.

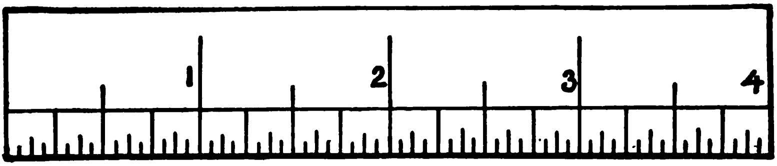
2. In this counting we begin with 15, and add another 15 for each count, making the second count — 15's, the third count — 15's, the fourth count — 15's, etc.

3. Write the multiplication table of 15's from 2 15's to 12 15's.

4. Write the division table of 15's from 30 to 180.

5. Drill upon these tables until you can give them promptly.

V. FRACTIONS



1. $1\frac{1}{2}$ in. + $\frac{3}{8}$ in. = x

See how much $1\frac{1}{2}$ in. is on the rule, and how much $\frac{3}{16}$ in. more makes.

2. $\frac{3}{4}$ in. − $\frac{5}{16}$ in. = x

Take $\frac{5}{16}$ in. out of $\frac{3}{4}$ in. upon the rule to find how much is left.

3. $2\frac{1}{4}$ in. ÷ $\frac{3}{8}$ in. = x

Find upon the rule how many $\frac{3}{8}$ in. in $2\frac{1}{4}$ in.

4. $\frac{2}{3}$ of $3\frac{3}{8}$ in. = x

Think $\frac{2}{3}$ of 3 in. and $\frac{2}{3}$ of 3 eighths inches.

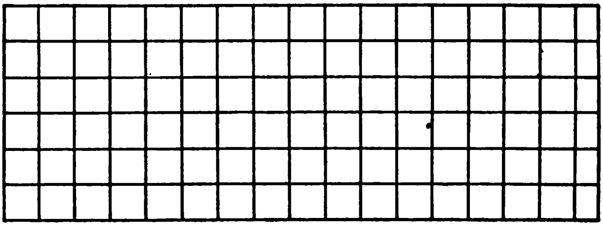
5. $3\frac{5}{8}$ in. − $1\frac{3}{16}$ in. = x, $1\frac{7}{8}$ in. + $2\frac{1}{16}$ in. = x

6. $3\frac{3}{4}$ in. ÷ $\frac{3}{4}$ in. = x, $2\frac{1}{2}$ in. − $1\frac{3}{16}$ in. = x

a. $2\frac{1}{4}$ in. + $\frac{5}{16}$ in. = x, $2\frac{1}{4}$ in. − $1\frac{11}{16}$ in. = x

b. A man had $6\frac{3}{4}$ acres of land, and sold $\frac{5}{6}$ of it. How much had he left?

VI. FRACTIONS — PERCENTAGE



1. How many whole squares in one horizontal row in the above rectangle? How many in all the rows?

2. How many more parts of squares in these rows? What part of a square in each of these? Measure.

3. Together they equal how many whole squares?

4. The parts and the wholes together equal how many squares?

5. One horizontal row is what part of the rectangle? What per cent?

6. Two horizontal rows are what part? What per cent?

7. Three horizontal rows are what part? What per cent?

8. Four horizontal rows are what part? What per cent?

9. Five horizontal rows are what part? What per cent?

10. Change to per cents $\frac{1}{3}$, $\frac{2}{3}$, $\frac{1}{6}$, $\frac{2}{6}$, $\frac{5}{6}$.

a. One correct answer out of 6 is what per cent correct?

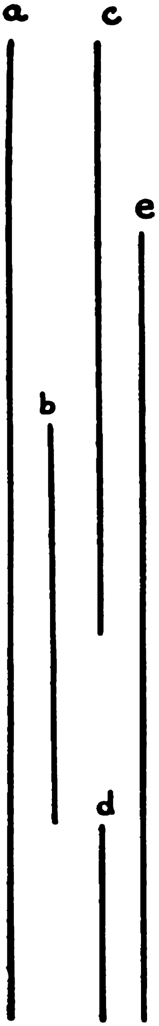
VII. MULTIPLICATION — DIVISION — SIXTEENS

1. Beginning with 16, count by 16's to 160, and backward to 16.

2. Write the multiplication table of 16's to 10 16's.

3. Write the division table of 16's from 32 to 160.

VIII. COMPARISON — LENGTH — FRACTIONS



1. *D* is 1. How much is *B? E? C? A?*
2. *B* is 1. How much is *E? D? C? A?*
3. *C* is 1. How much is *D? B? E? A?*
4. *E* is 1. How much is *D? B? C? A?*
5. *A* is 1. How much is *D? C? E? B?*

a. Take 10 ft. as 1. How much is 10 yd.? $13\frac{1}{3}$ yd.?

b. Take 11 yd. as 1. How much is 11 ft.? 33 yd.?

c. Take 2 yd. as 1. How much is 30 ft.? 33 ft.?

IX. FRACTIONS — PERCENTAGE

1. Take *A* as 1. What per cent is *D? B? C? E?*

2. *E* is 1. What per cent is *B? D? C? A?*

3. *C* is 1. What per cent is *D? B? E?*

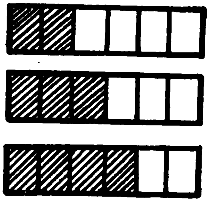
4. *B* is 1. What per cent is *D? C? A?*

a. Take *D* as 1. $A + B + C = x$
b. Take *A* as 1. $B + E + D - C = x$
c. Take *B* as 1. $D + C + E - A = x$

X. FRACTIONS

1. $\frac{7}{8}$ in. + $\frac{3}{4}$ in. $= x$, $\frac{9}{16}$ in. − $\frac{3}{8}$ in. $= x$
2. $3\frac{5}{8} + 2\frac{3}{16} = x$, $\frac{2}{3} - \frac{3}{8} = x$
3. $1\frac{2}{3}$ ft. − $\frac{3}{4}$ ft. $= x$, $3\frac{3}{4}$ ft. − $1\frac{1}{3}$ ft. $= x$
4. $5\frac{7}{8} + 1\frac{13}{16} = x$, $5\frac{7}{8} - 1\frac{13}{16} = x$
5. $\$1\frac{1}{4} + \$\frac{5}{6} = x$, $\$1\frac{1}{4} - \$\frac{5}{6} = x$

XI. WAYS OF INCREASING A FRACTION



1. How do these rectangles compare in size?

Think of the shaded parts of each as a fraction.

2. How many parts in the first fraction?

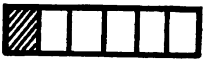
3. How many parts in the second?

4. How many in the third?

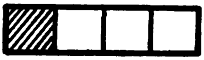
5. How does taking more parts affect the size of the fraction?

I. Increasing the number of parts in a fraction makes the fraction larger.

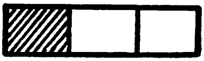
A



B



C



6. Compare the fractions *A* and *B*, *B* and *C*, and *A* and *C*.

7. How many parts in the whole of *A?*

8. How many parts in the whole of *B?* of *C?*

9. How does making less parts in the whole affect the size of the parts? How does it affect the fraction?

II. Diminishing the number of parts in the whole makes the fraction larger by making the parts larger.

The number of equal parts in a fraction is its numerator.

Also the **word or figure which expresses this number** is called the numerator.

10. Write statement I above, using the word numerator in place of the group of words which mean the same thing.

11. Write 3 fractions larger than $\frac{1}{8}$, obtained by increasing the numerator of that fraction.

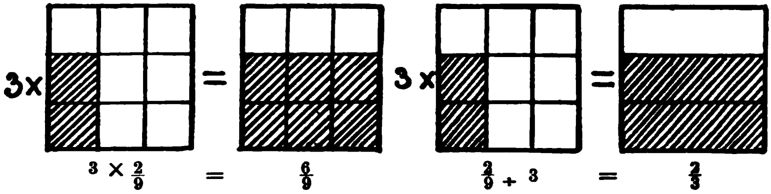
The number of equal parts in the whole is the denominator of the fraction.

Also the **word or figure which expresses this number** is called the denominator.

12. Write statement II above, using the word denominator for the group of words which mean the same thing.

XII. MULTIPLICATION OF FRACTION BY WHOLE NUMBER

1. What fraction is shown in the square at the left?


3x
=
3 x
=
$3 \times \frac{2}{9} = \frac{6}{9}$
$\frac{2}{9} + 3 = \frac{2}{3}$

2. What is its numerator?

3. If the numerator is multiplied by 3, how is the value of the fraction affected? The fraction has been multiplied by what? What does 3 times $\frac{2}{9}$ equal?

4. What fraction is shown in the third square?

5. What is its denominator?

6. If the denominator (the number of parts in the whole) is divided by 3, there are then how many parts in the whole? What are these parts?

7. These parts are shown in the fourth square. They are how many times as large as before dividing the denominator? The fraction has been made how many times as great? It has been multiplied by what? What is the product?

8. How do the two products 6 and $\frac{2}{3}$ compare in value?

9. Which is the simpler? Which is the better method, multiplying the numerator, or dividing the denominator?

10. $5 \times \frac{2}{15} = x$ $4 \times \frac{3}{20} = x$ $3 \times \frac{7}{9} = x$ $8 \times \frac{3}{16} = x$

11. $2 \times \frac{3}{8} = x$ $2 \times \frac{5}{12} = x$ $3 \times \frac{4}{15} = x$ $3 \times \frac{2}{5} = x$

To multiply a fraction by a whole number, divide the denominator if possible; otherwise multiply the numerator.

XIII. MULTIPLICATION OF FRACTION BY WHOLE NUMBER

1. $5 \times \frac{3}{4}$ in. $= x$ $7 \times \frac{5}{12}$ in. $= x$ $5 \times \frac{7}{10}$ in. $= x$

Change improper fractions in answers to whole or mixed numbers.

2. $9 \times \frac{2}{16}$ in. $= x$ $4 \times \frac{7}{8}$ yd. $= x$ $5 \times \frac{7}{8}$ in. $= x$

3. $4 \times \frac{11}{16}$ lb. $= x$ $8 \times \frac{1}{16}$ lb. $= x$ $5 \times \frac{11}{16}$ lb. $= x$

4. $3 \times \frac{7}{16}$ in. $= x$ $3 \times \frac{5}{16}$ in. $= x$ $9 \times \frac{2}{3}$ ft. $= x$

5. $3 \times \frac{2}{9}$ yd. $= x$ $5 \times \frac{4}{9}$ yd. $= x$ $6 \times \frac{5}{12}$ ft. $= x$ $8 \times \frac{5}{32}$ in. $= x$

6. $9 \times \frac{7}{12}$ ft. $= x$ $4 \times \frac{7}{12}$ ft. $= x$ $3 \times \frac{5}{32}$ in. $= x$ $16 \times \frac{3}{32}$ in. $= x$

a. $6 \times 1\frac{5}{36}$ yd. $= x$ $8 \times 1\frac{5}{36}$ yd. $= x$ $9 \times 1\frac{5}{32}$ yd. $= x$

b. $16 \times 1\frac{1}{32}$ in. $= x$ $9 \times 1\frac{3}{32}$ in. $= x$ $12 \times 1\frac{7}{24}$ in. $= x$

XIV. REVIEW

1. Change $\frac{1}{10}$, $\frac{1}{5}$, $\frac{1}{20}$, $\frac{1}{6}$, $\frac{1}{3}$, $\frac{2}{3}$, $\frac{5}{6}$, and $\frac{1}{2}$ to per cents.

2. Four correct answers out of 6 is what per cent correct?

3. Four out of 5 correct is what per cent correct?

4. $4 \times \frac{3}{8}$ in. $= x$ $5 \times \frac{5}{12}$ ft. $= x$ $6 \times \frac{5}{12}$ ft. $= x$ $\frac{1}{2}$ yd. $+ \frac{1}{3}$ yd. $= x$

5. $\frac{1}{3}$ of $\frac{1}{2}$ yd. $= x$ $\frac{1}{2}$ of $\frac{3}{4}$ in. $= x$ $\frac{2}{3} - \frac{1}{4} = x$

a. A family ate $1\frac{7}{8}$ lb. of steak on Thursday and $2\frac{1}{4}$ lb. on Sunday. How much did they eat on both days?

XV. MULTIPLICATION — DIVISION — FOURTEENS

1. Beginning with 14, write the counts by 14's to 98, and backward to 14.

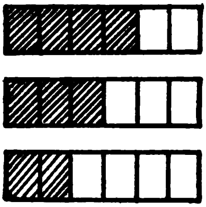
2. Write the multiplication table of 14's from 2 14's to 7 14's.

3. Write the division table of 14's from 28 to 98.

XVI. REVIEW

1. $5 \times \frac{7}{10} = x$ $5 \times \frac{6}{8} = x$ $11\frac{1}{2}$ in. $- \frac{3}{8}$ in. $= x$
2. $24 \times \frac{3}{4} = x$ $4 \times \frac{10}{16}$ lb. $= x$ $\frac{2}{3} \times \frac{5}{9}$ yd. $= x$
3. $3 \times \$5\frac{3}{4} = x$ $5 \times \frac{3}{4} = x$ $4 \times \$5\frac{3}{4} = x$
4. $\frac{4}{5} = x\%$ $\frac{2}{3} = x\%$ $\frac{1}{6} = x\%$ $\frac{1}{3} = x\%$ $\frac{5}{6} = x\%$

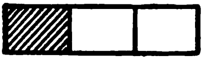
XVII. WAYS OF DIMINISHING A FRACTION

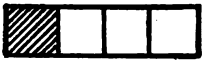


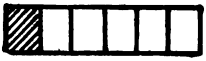
1. How do these rectangles compare in size?

2. Think of the shaded parts of each as a fraction. What is the numerator of the first fraction?

3. What is the numerator of the second? Of the third?


A


B


C

4. How does diminishing the numerator affect the size of the fraction?

Diminishing the numerator makes the fractions smaller by making fewer parts in the fraction.

5. Compare the fractions *A* and *B*, *B* and *C*, and *A* and *C*.

6. What is the denominator of *A?*

7. What is the denominator of *B?* Of *C?*

8. How does increasing the denominator affect the size of the parts? How does it affect the size of the fraction?

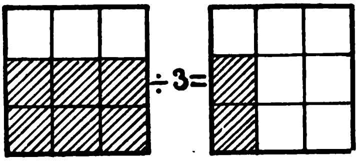
Increasing the denominator makes the fraction smaller by making the parts smaller.

9. Write 3 fractions smaller than $\frac{5}{7}$, obtained by diminishing the numerator of that fraction.

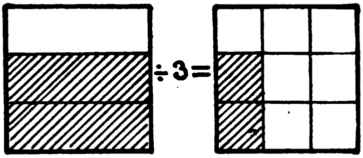
10. Write 3 fractions smaller than $\frac{2}{3}$, obtained by increasing the denominator of that fraction.

XVIII. DIVISION OF A FRACTION BY A WHOLE NUMBER

1. What fraction is shown in the square at the left?



$$\frac{6 \div 3}{9} = \frac{2}{9}$$



$$\frac{2}{3 \times 3} = \frac{2}{9}$$

2. What is its numerator? If the numerator (the number of parts in the fraction) is divided by 3, it becomes what? The fraction becomes what? The fraction has been divided by what? $\frac{2}{3} \div 3 = x$

3. What fraction is shown in the third square? How does this compare with $\frac{6}{9}$ in value? Can its numerator be divided by 3 without remainder? What is its denominator?

4. If the number of parts in the whole (the denominator) is multiplied by 3, it becomes what? The fraction becomes what? This is what part as great as $\frac{2}{3}$?

5. Multiplying the denominator by 3 divides the fraction by what?

To divide a fraction by a whole number, divide the numerator if possible without remainder; otherwise, multiply the denominator.

6. $\frac{4}{9}$ yd. $\div 2 = x$ $\frac{4}{9}$ yd. $\div 3 = x$ $\frac{9}{16}$ in. $\div 3 = x$

7. $\frac{3}{8}$ in. $\div 5 = x$ $\frac{3}{8}$ in. $\div 3 = x$ $\frac{15}{16}$ in. $\div 5 = x$

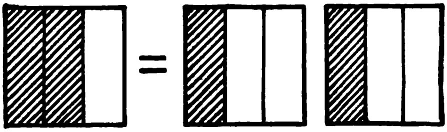
8. $\frac{15}{16}$ in. $\div 4 = x$ $\frac{7}{8}$ yd. $\div 7 = x$ $\frac{7}{8}$ yd. $\div 4 = x$

a. $6\frac{3}{4}$ d. $\div 3 = x$ $9\frac{2}{3}$ yd. $\div 3 = x$ $12\frac{1}{3}$ h. $\div 4 = x$

b. $12\frac{5}{6}$ in. $\div 4 = x$ $10\frac{5}{8}$ in. $\div 5 = x$ $6\frac{5}{16}$ in. $\div 5 = x$ $6\frac{5}{8}$ in. $\div 3 = x$

c. How many square yards in a rug $3\frac{1}{2}$ yd. by 5 yd.?

XIX. FRACTION OF A WHOLE NUMBER



$\frac{2}{3}$ of 1 = $\frac{1}{3}$ of 2

1. $\frac{4}{5}$ of 25¢ $= 4 \times \frac{1}{5}$ of 25¢ $= x$ $\frac{3}{4}$ of 20 in. $= 3 \times \frac{1}{4}$ of 20 in. $= x$

2. $\frac{5}{8}$ of 2 mi. $= \frac{1}{8}$ of 5×2 mi. $= x$ $\frac{3}{7}$ of 8 d. $= \frac{1}{7}$ of 3×8 d. $= x$

3. $\frac{2}{3}$ of 12 in. $= x$ in., $\frac{2}{3}$ of 11 in. $= x$ in.

4. In the above we may find 2 times $\frac{1}{3}$ of the number, or $\frac{1}{3}$ of 2 times the number. Which is the easier way to find $\frac{2}{3}$ of 12 in.? Why?

5. Which is the easier way to find $\frac{2}{3}$ of 11 in.? Why?

In both cases we *divide by the denominator* of the fraction and *multiply by the numerator.* In one case *we divide first,* and in the other we *multiply first.*

6. $\frac{4}{5}$ of 12 lb. $= x$, $\frac{4}{5}$ of 30 lb. $= x$, $\frac{5}{7}$ of 20 d. $= x$

Use the easier way for each part.

7. $\frac{5}{7}$ of $28 = x$ $\frac{3}{4}$ of $\$48 = x$ $\frac{3}{4}$ of $\$15 = x$

8. $4 \times \frac{2}{3} = x$ $\frac{2}{3}$ of $4 = x$ $4 \times \frac{2}{3} = \frac{2}{3}$ of 4

A number times a fraction equals the fraction of the number.

a. $\frac{3}{4}$ of $\$ 8\frac{4}{5} = x$ dollars $\frac{3}{4}$ of $\$5\frac{2}{3} = x$ dollars

XX. FRACTION OF A FRACTION

1. $\frac{3}{4}$ of $\frac{8}{9} = 3 \times \frac{1}{4}$ of $\frac{8}{9} = x$ $\frac{2}{5}$ of $\frac{10}{11} = 2 \times \frac{1}{5}$ of $\frac{10}{11} = x$
2. $\frac{6}{7}$ of $\frac{14}{15} = 6 \times \frac{1}{7}$ of $\frac{14}{15} = x$ $\frac{5}{8}$ of $\frac{24}{25} = 5 \times \frac{1}{8}$ of $\frac{24}{25} = x$
3. $\frac{2}{3}$ of $\frac{4}{5} = \frac{1}{3}$ of $2 \times \frac{4}{5} = x$ $\frac{3}{4}$ of $\frac{7}{8} = \frac{1}{4}$ of $3 \times \frac{7}{8} = x$
4. $\frac{3}{7}$ of $\frac{2}{9} = \frac{1}{7}$ of $3 \times \frac{2}{9} = x$ $\frac{8}{9}$ of $\frac{2}{3} = \frac{1}{9}$ of $8 \times \frac{2}{3} = x$

Proceed as in finding a fraction of a whole number. But in these exercises we have a fraction to divide by the denominator. In what two ways may a fraction be divided by a whole number? In each case use the easier way.

5. $\frac{2}{3}$ of $\frac{3}{4}$ in. $= x$ in., $\frac{2}{3}$ of $\frac{9}{10}$ m. $= x$ m.
How do you find $\frac{1}{3}$ of the fraction here?

6. $\frac{4}{5}$ of $\frac{15}{16}$ in. $= x$ in., $\frac{3}{5}$ of $\frac{15}{32}$ in. $= x$ in.

7. $\frac{3}{4}$ of $\frac{5}{6}$ ft. $= x$ ft., $\frac{3}{4}$ of $\frac{3}{8}$ in. $= x$ in.

8. In exercise 7, did you find $\frac{1}{4}$ of the fraction by dividing the numerator, or by multiplying the denominator?

9. Having $\frac{1}{4}$ of the fraction, how can $\frac{3}{4}$ be found?

In finding the fraction of the fraction in this case we have *multiplied the denominators together for the denominator,* and *the numerators for the numerator, of the result.* The result may always be obtained in that way.

10. $\frac{2}{3}$ of $\frac{13}{15}$ h. $= x$ h., $\frac{2}{3}$ of $\frac{9}{10}$ h. $= x$ h.

11. What is the best way of thinking the second part of exercise 10?

12. $\frac{5}{8}$ of $\frac{1}{2}$ in. $= x$ in., $\frac{7}{8}$ of $\frac{3}{4}$ in. $= x$ in.

a. $\frac{5}{7}$ of $28\frac{3}{5}$ d. $= x$ d., $\frac{2}{9}$ of $36\frac{3}{4}$ h. $= x$ h.
b. $\frac{3}{8}$ of $48\frac{3}{4}$ in. $= x$ in., $\frac{5}{8}$ of $72\frac{1}{2}$ in. $= x$ in.

XXI. REVIEW

1. $\frac{3}{5}$ of $\frac{6}{10} = x$ $\frac{3}{4}$ of $\frac{5}{12} = x$ $\frac{2}{3}$ of $\frac{6}{9} = x$
2. $\frac{5}{6}$ of 36 in. $= x$ $\frac{3}{5}$ of 12 in. $= x$ $\frac{3}{8}$ of 12 in. $= x$
3. $4 \times \frac{7}{8}$ in. $= x$ $5 \times \frac{7}{8}$ in. $= x$ $9 \times \frac{3}{8}$ in. $= x$
4. $\frac{3}{4} + \frac{6}{10} = x$ $\frac{3}{8} - \frac{1}{3} = x$ $\frac{4}{5} + \frac{1}{4} = x$ $2\frac{1}{4}$ in. $-$ $\frac{5}{8}$ in. $= x$
5. $\frac{2}{5} = x\%$ $\frac{1}{6} = x\%$ $\frac{2}{3} = x\%$ $\frac{5}{6} = x\%$

6. Fred answered 8 questions out of 10 correctly. What per cent was correct?

a. George lives $\frac{3}{4}$ mi. and Sam $1\frac{1}{3}$ mi. east of the post-office. How far apart do they live?

XXII. MULTIPLICATION OF A MIXED NUMBER BY A WHOLE NUMBER

1. $3 \times 4\frac{1}{2}$ in. $= x$ $5 \times 6\frac{1}{3}$ yd. $= x$ $4 \times 6\frac{2}{3}$ yd. $= x$

To multiply a mixed number by a whole number, **multiply the entire part and the fraction separately, and add the products.**

2. $4 \times 6\frac{2}{3}$ yd. $= x$ yd., $8 \times 5\frac{3}{4}$ lb. $= x$ lb.
3. $5 \times 2\frac{3}{4}$ min. $= x$ min., $5 \times 4\frac{3}{8}$ mi. $= x$ mi.,
4. Find the area of a rectangle $6\frac{1}{2}$ in. by 5 in.?
5. Find the cost of 6 barrels of apples @ $2.75.
6. Of 8 tons of coal @ $7.25 per ton.
7. Of 6 boxes of oranges @ $2.75.
8. Of 4 barrels of potatoes @ $4.50.

a. Of 6 tons of coal @ $6.875.

b. Of a cyclopedia of 20 volumes @ $2.25 per volume.

XXIII. FRACTION OF A MIXED NUMBER

1. $\frac{3}{4}$ of $4\frac{1}{2}$ in. $= x$ in. $\frac{2}{5}$ of $15\frac{1}{4}$ in. $= x$ in.

$\frac{3}{4}$ of 4 in. $= x$ in. $\frac{3}{4}$ of $\frac{1}{2}$ in. $= x$ in. 3 in. $+ \frac{3}{8}$ in. $= x$ in.

2. $\frac{2}{3}$ of $9\frac{3}{4}$ min. $= x$ min. $\frac{2}{3}$ of $12\frac{1}{2}$ min. $= x$ min.
3. How did you find the fractions of the mixed numbers in 1 and 2?
4. $\frac{2}{5}$ of $4\frac{1}{2}$ in. $= x$ in. $\frac{1}{6}$ of $8\frac{1}{2}$ in. $= x$ in.

$4\frac{1}{2} = \frac{x}{2}$. $\frac{1}{5}$ of $\frac{9}{2} = \frac{9}{x}$. $\frac{2}{5}$ of $\frac{9}{2} = \frac{x}{10}$. $\frac{18}{10} = x$.

5. $\frac{3}{4}$ of $3\frac{2}{3}$ yd. $= x$ yd. $\frac{3}{7}$ of $7\frac{1}{2} = x$

Find the fraction of the whole number and the fraction separately and add these results, if not too difficult. Otherwise, change to an improper fraction, and find the fraction of this.

a. $\frac{5}{8}$ of $8\frac{2}{3}$ yd. $= x$ yd. $\frac{3}{8}$ of $2\frac{3}{4}$ lb. $= x$ lb.

XXIV. MULTIPLICATION OF A MIXED NUMBER BY A MIXED NUMBER

1. $2\frac{1}{2} \times 4\frac{3}{4}$ ft. $= x$ ft.
$2 \times 4\frac{3}{4}$ ft. $= x$ ft., $\frac{1}{2}$ of $4\frac{3}{4}$ ft. $= x$ ft., $9\frac{1}{2}$ ft. $+ 2\frac{3}{8}$ ft. $= x$ ft.

To multiply a mixed number by a mixed number, multiply by the entire part of the multiplier, find the fractional part indicated in the multiplier, and add the two results.

2. How many square rods in a lot of land $6\frac{3}{4}$ rd. long and 3 rd. wide? In one $6\frac{3}{4}$ rd. by $\frac{2}{3}$ rd.? In one $6\frac{3}{4}$ rd. by $3\frac{2}{3}$ rd.?

3. Find the cost of 8 tons of coal @ \$$6\frac{3}{4}$. Of $\frac{1}{2}$ ton. Of $8\frac{1}{2}$ tons.

4. Of 6 tons of hay @ \$$16\frac{1}{2}$. Of $\frac{1}{4}$ ton. Of $6\frac{1}{4}$ tons.

5. Of 16 yd. of carpeting @ \$$1\frac{1}{8}$. Of $\frac{1}{2}$ yd. Of $16\frac{1}{2}$ yd.

XXV. ADDITION

Add first by lines and then by columns, writing only the sum of each line and each column:

Add first the dollars and then the cents of each number, thus: \$5.25, \$11.25, \$11.55, \$12.55, \$13.30, etc.; or add first the cents and then the dollars.

	1.	**2.**	**3.**	**4.**	**5.**
1.	\$5.25	\$ 6.30	\$ 1.75	\$4.50	\$ 6.20
2.	\$3.80	\$ 4.60	\$10.40	\$2.75	\$ 1.50
3.	\$2.90	\$ 7.25	\$ 8.50	\$1.45	\$ 9.25
4.	\$8.30	\$12.50	\$20.40	\$3.50	\$10.75
5.	\$4.25	\$ 5.75	\$ 3.60	\$5.25	\$ 7.30

a. If a man's wages were \$1.50 per day, and were increased 10%, how much did he then receive?

b. Find the cost of a 20-pound tub of butter @ $32\frac{1}{2}$¢.

c. In a week a man earned \$2.80, \$4.50, \$3.40, \$3.75, \$3.50, and \$4.60. Find the amount of these sums.

XXVI. DIVISION OF A MIXED NUMBER BY A WHOLE NUMBER

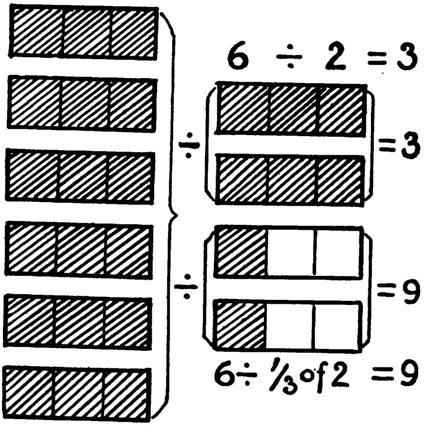
1. $8 \div 4 = x \quad \frac{1}{2} \div 4 = x \quad 8\frac{1}{2} \div 4 = x$
2. $8 \div 4 = x \quad 1\frac{1}{2} = \frac{x}{2} \div 4 = \frac{3}{x} \quad 9\frac{1}{2} \div 4 = x$
3. $18 \div 6 = x \quad 2\frac{2}{3} = \frac{x}{3} \div 6 = \frac{8}{x} \quad 20\frac{2}{3} \div 6 = x$

To divide a mixed number by a whole number, divide the entire part of the mixed number; if there is a remainder, change that and the fraction to an improper fraction, and divide the fraction.

4. $16\frac{1}{4} \div 5 = x \quad 22\frac{1}{2} \div 4 = x \quad 27\frac{2}{3} \div 3 = x$

   a. $39\frac{1}{3}$ m. $= x$ yr. $\quad 62\frac{1}{2}$ m. $= x$ yr.

XXVII. DIVISION OF A WHOLE NUMBER BY A FRACTION



1. How many rectangles in the tier at the left? How many in the upper group at the right? The shaded parts of the lower group are what part of how many?

2. $\frac{1}{3}$ of 2 is called second view of $\frac{2}{3}$. Write the second view of $\frac{3}{4}$, $\frac{2}{5}$, $\frac{5}{6}$, $\frac{3}{7}$, $\frac{7}{8}$, and $\frac{8}{9}$.

3. $6 \div \frac{2}{3} = x$

   $6 \div 2 = x \quad 6 \div \frac{1}{3}$ of 2
   $= 3 \times 3 = x$

4. $8 \div \frac{4}{5} = x$

To divide by a fraction, divide by the numerator and multiply the result by the denominator.

5. $10 \div \frac{2}{3} = x \quad 8 \div \frac{2}{3} = x \quad 12 \div \frac{2}{3} = x$
6. $12 \div \frac{3}{4} = x \quad 18 \div \frac{3}{5} = x \quad 6 \div \frac{3}{7} = x$

7. $8 \div \frac{3}{5} = x$

$8 \div 3 = \frac{8}{3}$ $\quad 8 \div \frac{1}{5}$ of $3 = 5 \times \frac{8}{3} = \frac{40}{3} = 13\frac{1}{3}$

8. $7 \div \frac{2}{3} = x \quad 9 \div \frac{4}{5} = x \quad 8 \div \frac{5}{6} = x \quad 5 \div \frac{3}{4} = x$

9. $12 \div \frac{7}{10} = x \quad 15 \div \frac{5}{8} = x \quad 11 \div \frac{3}{4} = x \quad 13 \div \frac{3}{5} = x$

10. $12 \div \frac{3}{4} = x \quad 8 \div \frac{3}{5} = x \quad 6 \div \frac{3}{5} = x$

11. $12 \div \frac{6}{7} = x \quad 10 \div \frac{4}{5} = x \quad 3 \div \frac{4}{5} = x$

12. Dividing by 6 in the first part of the above is finding what part of 12? Multiplying this sixth by 7 is finding what part of 12? **The dividing a number by $\frac{6}{7}$ is the same as finding $\frac{7}{6}$ of the number.** Dividing by $\frac{2}{3}$ is the same as finding what? Dividing by $\frac{3}{4}$ is the same as what?

It is sometimes convenient in written work to invert a fractional divisor and consider it a multiplier.

a. $8 \div \frac{3}{8} = x \quad 10 \div \frac{3}{16} = x \quad 10 \div \frac{4}{7} = x$

XXVIII. DIVISION OF A FRACTION BY A FRACTION

1. $\frac{4}{5} \div \frac{2}{7} = x$

$\frac{4}{5} \div 2 = \frac{2}{5}$ $\quad \frac{4}{5} \div \frac{1}{7}$ of $2 = \frac{14}{5} = 2\frac{4}{5}$

2. $\frac{8}{9} \div \frac{4}{11} = x$

$\frac{8}{9} \div 4 = \frac{}{9}$ $\quad \frac{8}{9} \div \frac{1}{11}$ of $4 = 11 \times \frac{2}{9} = x$

3. $\frac{9}{10} \div \frac{2}{7} = x$

$\frac{9}{10} \div 2 = \frac{9}{20}$ $\quad \frac{9}{10} \div \frac{1}{7}$ of $2 = 7 \times \frac{9}{20} = x$

Notice that **the method in these exercises is the same as in dividing a whole number by a fraction**; but the dividend is a fraction.

What two methods of dividing a fraction by a whole number are there?

What two methods of multiplying a fraction by a whole number?

4. $\frac{4}{5} \div \frac{3}{4} = x \quad \frac{6}{7} \div \frac{3}{8} = x \quad \frac{5}{8} \div \frac{2}{3} = x \quad \frac{5}{9} \div \frac{3}{4} = x$

5. $\frac{7}{9} \div \frac{3}{4} = x \quad \frac{9}{11} \div \frac{3}{4} = x \quad \frac{7}{8} \div \frac{2}{3} = x \quad \frac{5}{9} \div \frac{2}{3} = x$

a. $\frac{8}{9} \div \frac{3}{10} = x \quad \frac{11}{20} \div \frac{2}{9} = x \quad \frac{7}{25} \div \frac{5}{9} = x \quad \frac{5}{24} \div \frac{2}{3} = x \quad \frac{3}{40} \div \frac{3}{4} = x$

b. $\frac{32}{33} \div \frac{8}{9} = x \quad \frac{11}{12} \div \frac{3}{4} = x \quad \frac{3}{4} \div \frac{15}{16} = x \quad \frac{15}{16} \div \frac{3}{4} = x$

XXIX. REVIEW

1. May lives $\frac{3}{8}$ mi. from school, and Jennie lives $\frac{3}{16}$ mi. farther. How far from school does Jennie live?

2. $8\frac{1}{8}\text{ in.} - 2\frac{3}{4}\text{ in.} = x \quad 2\frac{1}{2}\text{ yd.} + 1\frac{1}{2}\text{ ft.} = x\text{ yd.}$

3. $\$2 = x\%\text{ of }\$5 \quad 10\%\text{ of }\$2 = x\text{¢}$

4. What part of a gallon is 2 qt. and 1 pt.?

5. What part of a gallon is $\frac{3}{4}$ of a quart?

6. What part of a yard is $\frac{2}{3}$ of a foot?

7. How many square feet in a rug $4\frac{1}{2}$ yd. long and 3 yd. wide?

8. $\frac{7}{8}\text{ of }10 = x \quad \frac{3}{4}\text{ of }10 = x \quad 10 \times \frac{3}{4} = x$

9. A room is 9 ft. long and 13 ft. wide. How many feet of picture molding is required for it?

10. $8 \times \frac{3}{4} = x \quad 4 \times 6\frac{2}{3} = x \quad 4\frac{1}{2} \times 6\frac{1}{2}\text{ yd.} = x$

a. An inch on a certain map represents 20 mi. on the earth. How far apart are two cities shown $6\frac{3}{4}$ in. apart on the map?

b. How long is a county which is shown $1\frac{3}{8}$ in. long on the map?

XXX. REVIEW

1. $8 \times \frac{7}{16}\text{ in.} = x \quad 5 \times \frac{3}{16}\text{ lb.} = x \quad 4 \times \frac{11}{16}\text{ lb.} = x$
2. $6\frac{3}{8}\text{ in.} \div 3 = x \quad \frac{7}{8}\text{ in.} \div 5 = x \quad 9\frac{1}{2} \div 3 = x$
3. $2\frac{5}{6}\text{ h.} + 1\frac{1}{3}\text{ h.} = x \quad 2\frac{5}{6}\text{ h.} + 8\frac{1}{4}\text{ h.} = x \quad 5 \times \frac{17}{20} = x$
4. $2\frac{5}{6}\text{ h.} - 1\frac{1}{3}\text{ h.} = x \quad \$7\frac{1}{2} \div \$2\frac{1}{2} = x \quad \frac{10}{11} \div 5 = x$
5. $\frac{3}{4} \div 8 = x \quad \frac{9}{10} \div 3 = x \quad \frac{5}{9} \div 11 = x$
6. $\frac{7}{8} \div \frac{2}{3} = x \quad \frac{3}{10} \div \frac{3}{4} = x \quad \frac{5}{8} \div \frac{4}{5} = x$
7. What per cent of 1 h. is 10 min.?

a. $3\frac{1}{2}\text{ in.} + 1\frac{9}{16}\text{ in.} = x \quad 3\frac{1}{2}\text{ in.} - 1\frac{9}{16}\text{ in.} = x$
b. $3\frac{1}{2}\text{ m.} \div 4 = x \quad \$8\frac{1}{2} - \$1\frac{4}{5} = x$
c. $1\frac{1}{2} \times \frac{2}{3} = x \quad 1\frac{1}{2} \div \frac{2}{3} = x$

XXXI. FRACTIONS — SCALE IN DRAWING

In this floor plan ⅛ in. represents 1 ft. on the floor. Notice how this fact is expressed below the plan. It is sometimes expressed in this way: ⅛ in. = 1 ft.

1. How long is the kitchen?

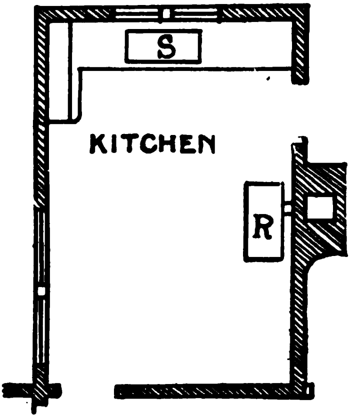
Measure the plan inside, and find the length from the scale.

2. How wide is it?

3. How long is the sink? The dresser at the right of it?

4. How long is the range?

5. The plan of a building 45 ft. long is drawn on a scale of ¼ in. to 1 ft. How long is the plan?



Scale ⅛ in. to 1 ft.

6. The building is 30 ft. wide. How wide is the plan?

7. If a map of your state is made on a scale of 1 in. to 10 mi., about how many inches should it measure from left to right?

8. How many inches from top to bottom?

9. A drawing of a bookcase on a scale of ¼ (¼ in. to 1 in.) measures 9 in. wide and 18 in. high. How wide is the bookcase?

10. How high is it?

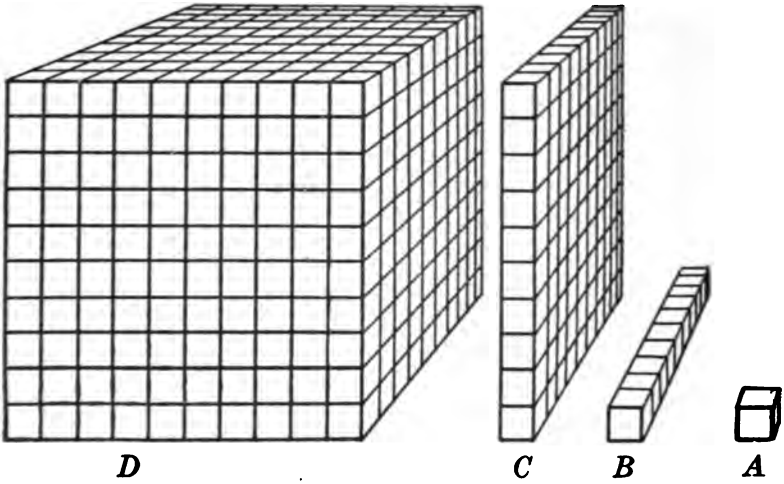
a. What is the approximate distance between two cities represented 1⅜ in. apart on the map in 7–8 above?

b. The scale of another map is 13 mi. to the inch. How far apart are two cities which are represented on this map 3¼ in. apart?

c. How far apart are two mountain peaks which are shown on this map 1⅛ in. apart?

d. Two cities shown 3⅜ in. apart?

XXXII. DECIMAL SYSTEM



Look at the diagram in answering these questions.

1. How many of *A* equal *B*?
2. How many of *B* equal *C*?
3. How many of *C* equal *D*?
4. How many of each of these units make one of the next larger?
5. *D* equals how many *C*? *C* equals how many *B*? *B* equals how many *A*?
6. Each of these units equals how many of the next smaller?
7. *B* is 1 what? *C* is 1 what? *D* is 1 what?
   2*B* are what? 5*C* are what? 8*D* are what?

Write with figures:

8. *A*, 5*A*, 3*A*, 7*A*, *B*, 2*B*, 4*B*, 9*B*.
9. *BA* (*B* and *A*) as one number, *B*2*A*, 2*B*5*A*.
10. *C*, 4*C*, *CB*2*A* as one number, *C*4*B*7*A*, 3*C*2*B*6*A*.

XXXIII. DECIMAL FRACTIONS

Look at the diagram in thinking these exercises.

Write with figures:

1. D, $2D$, $9D$, $2D4C6BA$, as one number.

Take B as the measure. **Keep the eye on it.**

2. A is what part? C is how many? D is how many?

Write with figures and decimal point:

3. A, $3A$, $5A$, B, $B6A$, $4B8A$, $7B3A$.
4. C, $8C$, $C2B4A$, $5C9B3A$, $7C2B9A$. D, $D2C5B3A$, $5D9C3B7A$.

Take C as 1. **Keep the eye on it.**

5. B is what part? A is what part? D is how many?

Write with figures and decimal point:

6. B, $2B$, A, $7A$, BA, $B2A$, $5B3A$.
7. C, $C5B$, $2C4B7A$, $D4C9B7A$, $9D4C3B7A$.

XXXIV. DECIMAL FRACTIONS

Take D as 1. **Keep the eye on it.**

1. What part is C? B? A? $2C$? $5B$? $8A$?
2. Write with figures and decimal point:
   D, $2C$, $5B$, $7A$, $2D5C$, $4D2C6BA$, $7D4C6B3A$.
3. Tenths are written in which place? Hundredths are written in which place? Thousandths in which place?
4. $\frac{1}{2}$ tenth $= x$ hundredths, $\frac{1}{2}$ hundredth $= x$ thousandths.
5. **Half of any unit equals 5 of the next smaller.**
6. **A fourth of any unit equals $2\frac{1}{2}$ of the next smaller.**

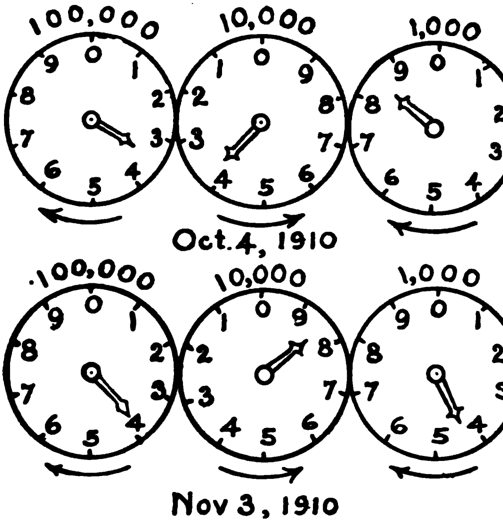
Express wholly in decimal form:

7. $8\frac{1}{2}$ tenths, $1\frac{1}{2}$ fifths, $\frac{1}{8}$, $\frac{3}{8}$, $\frac{5}{8}$, $\frac{12}{25}$, $\frac{17}{20}$.
8. $87\frac{1}{2}\%$, $37\frac{1}{2}\%$, $\frac{1}{4}\%$, $6\frac{1}{4}\%$, $\frac{3}{4}\%$, $\frac{1}{8}\%$, $\frac{5}{8}\%$.

XXXV. DECIMAL SYSTEM — GAS-METER

1. The figures on the right dial of the gas-meter shown at the left indicate the number of hundreds of cubic feet of gas used. If the hand points to 4, it indicates the use of how many cubic feet of gas? Pointing to 7, it indicates the use of how many cubic feet? Pointing between 8 and 9, it indicates the use of how many cubic feet?

2. Does the hand on this dial turn toward the left or toward the right?* In which direction does the hand on the middle dial turn? The hand on the left dial?



Gas-Meter

3. The figures on the middle dial indicate thousands of cubic feet of gas. How far, then, does the hand on this dial move while the hand on the dial at the right makes a complete revolution?

4. When the hand on the middle dial points to 7, it indicates the use of how many thousands of feet of gas?

5. How many revolutions will the hand on the right dial complete while that on the middle dial is completing 1 revolution?

---

* The hand is said to turn in the direction in which it moves over the upper part of the dial.

6. A complete revolution of the hand on the middle dial indicates the use of how many cubic feet of gas?

7. The figures on the left dial indicate ten-thousands of feet of gas. When the hand on this dial points to 2, it indicates the use of how many thousands of feet of gas?

8. How far does the hand on this dial move while that on the middle dial is making a complete revolution? How many revolutions will the hand on the right dial have made in the same time?

XXXVI. DECIMAL SYSTEM — GAS-METER

1–2. Review XXXV.

3. In the upper view of the meter, the hand on the left dial indicates the use of how many complete 10-thousands of feet of gas?

4. The hand on the middle dial shows that how many more complete thousands of feet have been used?

5. On the right dial it is the custom to take the reading of the nearest even figure. In this case it is what figure?

6. What is the whole number of feet of gas shown to have been used at this reading of the meter on October 4?

7–8. Get the reading for November 3 by answering the questions 3–6 above.

9. How many feet of gas shown to have been used November 3 have been used since the reading of October 4?

10. This is the amount charged for the month of October. At $1.00 per 1000 ft., how much is the gas bill for October?

XXXVII. REVIEW

1. A piece of cloth $\frac{3}{4}$ of a yard wide and $\frac{5}{6}$ of a yard long, contains what part of a square yard?

2. Fred walks $\frac{1}{3}$ of a rod in a second. How many rods will he walk in a minute? In 4 minutes? In 16 minutes?

3. On a scale of $\frac{1}{8}$ in. to 1 ft., how long a line will represent a side of a room 20 ft. long?

4. $\frac{3}{4}$ ton + $\frac{3}{5}$ ton $= x$ tons, $\frac{3}{4}$ T. $\div$ $\frac{3}{5}$ T. $= x$

a. $\frac{4}{5} - \frac{2}{3} = x$ $\quad \frac{4}{5} \div \frac{2}{3} = x$ $\quad \frac{2}{5}$ of $\frac{3}{4}$ in. $= x$ in.

XXXVIII. REVIEW

1. How much is $\frac{1}{4}$ of $6\frac{1}{2}$ yd. of ribbon?

2. How wide a piece of floor will 17 $3\frac{1}{2}$-inch boards cover?

3. Find the cost of $4\frac{1}{2}$ yd. of cloth @ \$$1\frac{3}{4}$ per yard.

4. Of 4 lb. 4 oz. of brisket beef @ 15¢.

5. Of 1 lb. 12 oz. of Hamburg steak @ 13¢ a pound.

a. How many $3\frac{1}{2}$-inch boards will cover a space 35 in. wide?

b. $3\frac{3}{4}$ yd. + $2\frac{1}{3}$ yd. $= x$ $\quad \frac{1}{4}$ of $\frac{3}{8} = x$

XXXIX. MULTIPLICATION BY 10, 100, 5, 50, 500

1. 10 ft. $= x$ inches, 100 yd. $= x$ feet

2. 1000 yd. $= x$ feet, 10 mi. $= x$ rods

3. 100 lb. $= x$ ounces, 1000 sq. yd. $= x$ square feet

4. 25 dimes $= x$ cents, \$200 $= x$ cents

5. 1000 gal. $= x$ cubic inches

6. How many square feet in a lot 100 ft. by 192 ft.?

7. Find the cost of 10 horses @ \$240. Of 5 horses.

To multiply by 5, find half of 10 times the number.

8. Find the cost of 5 pairs of shoes @ \$2.28.

9. Find the cost of 100 cows @ \$48. Of 50 cows.

10. Find the cost of 50 bu. of corn @ 68¢. At 72¢.

XL. DECIMAL FRACTIONS

Write in decimal form in position to add:

1. $2\frac{7}{10}$, $25\frac{17}{100}$, $27\frac{333}{1000}$.

2. $\frac{1}{2}$, $2\frac{2}{5}$, $9\frac{3}{4}$, $243\frac{1}{5}$.

3. $\frac{1}{4}$, $48\frac{3}{4}$, $241\frac{72}{1000}$, $\frac{1}{8}$.

4. $12\frac{1}{2}$, $\frac{12\frac{1}{2}}{100}$, $\frac{3}{8}$, $\frac{5}{8}$.

5. $\$3\frac{7}{8}$, $\$294\frac{3}{5}$, $\$29\frac{1}{8}$, $\$62\frac{3}{8}$.

a. $2\frac{8}{1000}$, $\frac{29}{100000}$, $\frac{42}{50}$.

XLI. MULTIPLICATION BY 15, 25, 75, TENS, HUNDREDS, THOUSANDS

1. How many square rods in a lot 24 rd. by 10 rd.?

2. In one 24 rd. by 5 rd.? In one 24 rd. by 15 rd.?

To multiply by 15, find 10 times the number and add half of that product.

3. Find the cost of 15 bl. of flour @ \$6.40. At \$6.60. At \$5.50.

4. Find the cost of 100 baskets of peaches @ 84¢. Of 25 baskets.

To multiply by 25, find $\frac{1}{4}$ of 100 times the number.

5. Find the cost of 25 bl. of apples @ \$2.40. At \$1.60. At \$1.80.

6. How many square rods in a field 25 rd. by 64 rd.? In one 25 rd. by 160 rd.? In one 25 rd. by 84 rd.?

7. Find the cost of 75 hens @ 80¢. At \$1.20. At 96¢.

8. Find the cost of 1000 shares of Midway Northern Oil Co. @ 80¢? How much for 3000 shares?

9. How much for 6000 A. of land @ \$15? For 4000 A.?

a. Find the cost of 5000 bu. of wheat @ 90¢.

b. Of 3000 A. of land @ \$19.50.

c. An inch on a certain map represents 20 mi. How far apart are two cities which are shown $4\frac{9}{16}$ in. apart on this map?

XLII. MULTIPLICATION BY 9, 11, 125, 250

1. Find the cost of 9 T. of coal @ $6.50.

In many cases the methods shown below are easier than the regular methods.

2. Find the cost of 9 A. of land @ $68.

Nine times $6.50 is how much less than 10 times $6.50?
Nine times a number equals 10 times the number less the number.

3. Of 9 sheep @ $4.90.
4. Of 11 horses @ $175.

Eleven times $175 is how much more than 10 times $175?
Eleven times a number equals 10 times the number plus the number.

5. Find the cost of 11 yd. of carpet @ $1.40.
6. Of 125 mules @ $160. Of 125 A. of land @ $28.

How many hundreds equal 125? How much will 100 mules cost? How much will $\frac{1}{4}$ of 100 cost?

7. Of 250 A. @ $24.

What part of 1000 is 250?
To multiply by 250, find $\frac{1}{4}$ of 1000 times the number.

8. How many square feet in a lot 250 ft. by 444 ft.?

   a. Find the cost of 50 yd. of felt @ $1.64.
   Of 250 yd. of linoleum @ 80¢. Of 11 cows @ $62.50.

XLIII. MULTIPLICATION OF $33\frac{1}{3}$, $66\frac{2}{3}$, $16\frac{2}{3}$, $12\frac{1}{2}$, $37\frac{1}{2}$, *ETC.*

1. Find the cost of 12 yd. of gingham @ $33\frac{1}{3}$¢.

What part of a dollar is $33\frac{1}{3}$¢? How many thirds of a dollar will 12 yd. cost? How many dollars?

2. Find the cost of 24 yd. of straw matting @ $33\frac{1}{3}$¢.
3. Of 27 yd. of ingrain carpet @ $66\frac{2}{3}$¢.

What part of a dollar is $66\frac{2}{3}$¢?

4. Of 180 A. of land @ \$$66\frac{2}{3}$.
5. Of 120 chickens @ $33\frac{1}{3}$¢.
6. Of 9 T. of fertilizer @ \$$33\frac{1}{3}$.

7. Find the cost of 15 yd. of wall-paper @ $66\frac{2}{3}$¢.

8. Of 18 yd. of print-cloth @ $16\frac{2}{3}$¢.

What part of a dollar is $16\frac{2}{3}$¢? How many sixths of a dollar will 18 yd. cost? How many dollars?

9. Find the cost of 28 yd. of ribbon @ $12\frac{1}{2}$¢.

What part of a dollar is $12\frac{1}{2}$¢? How many eighths of a dollar will 28 yd. cost? How many dollars?

10. Find the cost of 32 yd. of carpet @ 1.12\frac{1}{2}$.

11. Of 12 yd. of lawn @ $37\frac{1}{2}$¢.

What part of a dollar is $37\frac{1}{2}$¢? How many eighths will 12 yd. cost? How many dollars?

a. Find the cost of 21 yd. of ingrain carpet @ $87\frac{1}{2}$¢.

b. Of 17 rolls of wall-paper @ $62\frac{1}{2}$¢.

XLIV. MULTIPLYING BY 9, 99, 999, 98, 198, ETC.

1. How much less is 99 than 100?

2. How much less are 8 99's than 800?

3. Find the amount which should be received for 4 pairs of shoes @ 99¢. At 95¢.

4. For 8 shirt-waists @ $1.98.

How much less is $1.98 than $2.00?

5. For 5 boys' suits @ $5.98. At $3.95.

6. For 3 girls' suits @ $4.98. At $4.95.

7. For 3 bicycles @ $21.95.

8. For 12 pr. of men's hose @ 19¢.

How much less is 19 than 20?

9. For 6 cameras @ $4.95.

10. For 99 Saturday Evening Posts @ 5¢.

a. For 2 outing suits @ $6.95.

b. For 16 buggies @ $49. At $45.

c. For 99 crates of onions @ $1.35.

XLV. MULTIPLYING BY MEANS OF FACTORS

1. $3 \times 5 \times 7 \times 2 = x$

First multiply the factors which will make 10 or 100. Then multiply the product of the other factors by the 10 or 100.

2. $2 \times 6 \times 16\frac{2}{3} \times 5 = x$ $2 \times 33\frac{1}{3} \times 5 \times 3 = x$

3. $6 \times 5 \times 16\frac{2}{3} \times 2 = x$ $5 \times 9 \times 7 \times 20 = x$

4. Find the cost of 35 A. of land @ $64.

Take out the factors of 10. Then find 10 times the product of the other factors.

5. Of 45 spelling-books @ 14¢.

6. Of 15 histories @ 48¢.

7. Of 35 note-books @ 18¢.

a. What is the area of a house lot 55 ft. by 64 ft.?

b. How many square feet in a lane 22 ft. wide and 55 ft. long?

XLVI. REVIEW

1. $15 \times 7 = x$ $16 \times 9 = x$ $14 \times 6 = x$

2. How much should be received for 12 pairs of shoes @ $1.98?

3. How many boards, each $\frac{2}{3}$ ft. wide, are required to cover a space $4\frac{1}{2}$ ft. wide?

4. A board was $4\frac{3}{4}$ in. wide. A strip $1\frac{3}{8}$ in. wide was sawed from this, and the sawing used up $\frac{1}{8}$ in. more of the width of the board. How wide was the part of the board remaining?

5. How many 30-inch pieces of ribbon can be cut from 40 yd.?

6. Find the cost of 20 pairs of gloves @ 99¢?

7. Of 40 baskets of strawberries at the rate of 2 baskets for 25¢?

8. Of $4\frac{1}{2}$ yd. of cloth @ $\$2\frac{1}{2}$ per yard.

XLVII. REVIEW

1. Find the cost of 75 lb. of chocolate creams @ $33\frac{1}{3}$¢. Of 62 cans of plums @ $16\frac{2}{3}$¢.

2. Of 25 lb. of butter @ 24¢. Of 11 yd. of lace @ 40¢.

3. Of 80 lb. of tea @ $37\frac{1}{2}$¢. Of 14 cans of pineapple @ 20¢.

4. Of 14 boys' suits @ \$4.95. Of 32 pairs of shoes @ \$1.99.

5. Find the cost of 45 geographies @ 80¢ (\$$\frac{4}{5}$).

6. Of 80 horses @ \$125.

7. Of 160 boxes of grapefruit @ \$2.75.

8. How many square rods in a lot of land $3\frac{3}{4}$ rd. wide and 8 rd. long?

Find the amount of gain on:

a. 200 T. of coal sold at a profit of $87\frac{1}{2}$¢ per ton.

b. 80,000 ft. of lumber sold at a profit of \$$3.33\frac{1}{3}$ per 1000 ft.

c. 1000 boxes of oranges sold at a profit of $37\frac{1}{2}$¢ per box.

XLVIII. DIVIDING BY 10, 100, 1000, ETC.

1. \$280 = x 10-dollar bills \$37,000 = x 100-dollar bills.

2. 154,000 lb. = x half tons 93,300 lb. = x half tons

3. 1% of 5280 ft. = x 10% of 320 rd. = x

4. At \$100 each how many shares of mill stock can be purchased for \$27,000? For \$35,000?

5. How many squares (hundred square feet) of roofing are required for 4000 sq. ft. of roof?

6. At \$500 each how many shares of bank stock can be bought for \$12,500?

a. 8% of 160 sq. rd. = x 5% of 320 rd. = x

XLIX. DIVISION BY 5, 50, 25

1. By saving 10¢ a day, how many days would it take to save $12.40?

2. By saving 5¢ per day, how many days would it take?

3. A earns $5 per day. How many days will it take him to earn $645?

4. A house is rented @ $50 per month. In how many months will the rent amount to $1850?

5. How many shares of stock must be sold at $50 to raise $25,000?

6. How many house lots, each with 50 ft. front, can be laid out on one side of a street 1 mile (5280 ft.) long?

7. How many lots with 25 ft. front could there be?

There are 4 times as many 25's as 100's in a number.

8. How many acres of land must be sold @ $25 each to raise $5000?

9. How many 5-cent car fares will it take to amount to $25.30?

10. How many 50-dollar bills equal $12,500?

a. 1000 lb. = x ounces   1 T. = x ounces

b. 1 cu. ft. = (nearly) $7\frac{1}{2}$ gallons   5 cu. ft. = x gallons.

L. PERCENTAGE — FRACTIONS

Express in fractional form 1 *to* 4*:*

1. $83\frac{1}{3}\%$, $33\frac{1}{3}\%$, $66\frac{2}{3}\%$.   **4.** 40%, 5%, 15%.

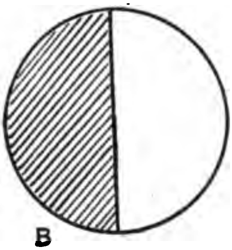
2. $16\frac{2}{3}\%$, $12\frac{1}{2}\%$, $37\frac{1}{2}\%$.   **5.** $2\frac{1}{2} \div \frac{3}{4} = x$ $\frac{3}{4} \div 2\frac{1}{2} = x$

3. $62\frac{1}{2}\%$, $87\frac{1}{2}\%$, 75%.

a. How many ounces in $37\frac{1}{2}\%$ of 1 lb.?

b. How many yards in the perimeter of a square $7\frac{1}{2}$ yd. on a side?

LI. COMPARISON — FRACTIONS



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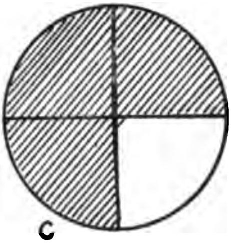

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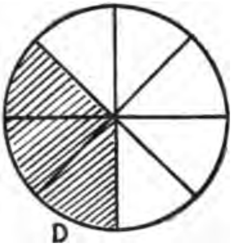

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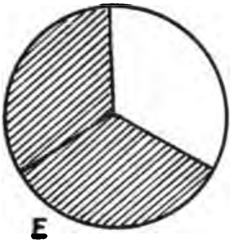

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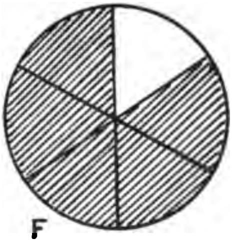

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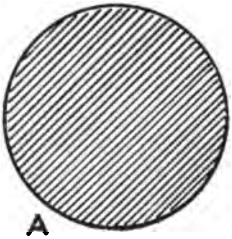


A

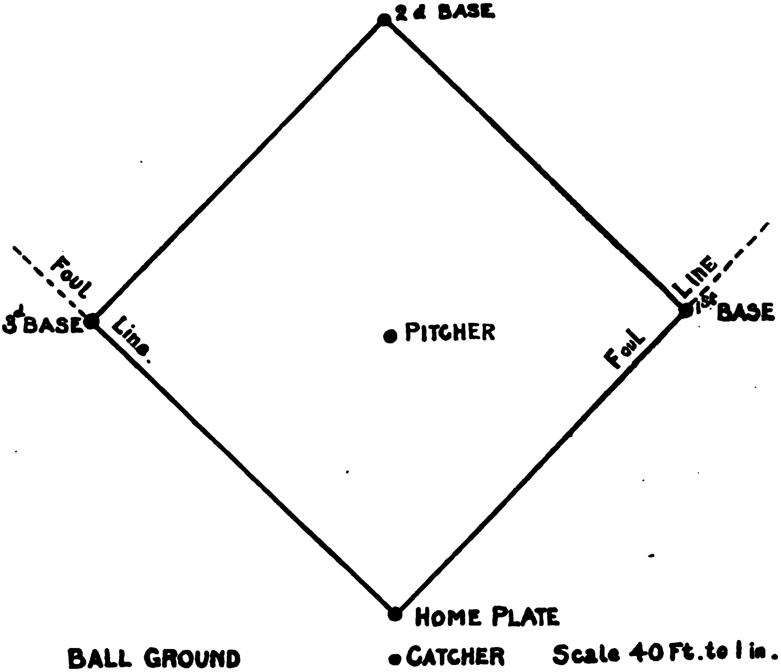
Think the shaded parts.

1. Taking A as 1, how much is B? C? D? E? F?
2. Taking B as 1, how much is C? D? E? F?
3. $\frac{3}{4} \div \frac{1}{2} = x$ $\frac{3}{8} \div \frac{1}{2} = x$ $\frac{2}{3} \div \frac{1}{2} = x$ $\frac{5}{6} \div \frac{1}{2} = x$
4. Take C as the measure. How much is A? B?
5. $1 \div \frac{3}{4} = x$ $\frac{1}{2} \div \frac{3}{4} = x$
6. With C as the measure, what is D? $\frac{3}{8} \div \frac{3}{4} = x$
7. Take E as the measure. What is A? B?
8. $1 \div \frac{2}{3} = x$ $\frac{1}{2} \div \frac{2}{3} = x$

a. $B = x\%$ of A $C = x\%$ of A $F = x\%$ of A
b. $D = x\%$ of A $E = x\%$ of A $E = x\%$ of F
c. $B = x\%$ of F $A = x\%$ of F $B = x\%$ of E

d. How many square yards in the ceiling of a room $4\frac{1}{3}$ yd. wide and $6\frac{1}{2}$ yd. long?

LII. LENGTH — FRACTIONS — PERCENTAGE



Find distances by measuring and using scale.

1. How far is the pitcher's plate from home plate?
2. How far is the third base from the home plate?
3. How far must the left-fielder, standing on the line midway between second and third, throw to reach home?
4. How far must the right-fielder, standing on foul line 35 ft. beyond first, throw to get the ball home?
5. How far must the catcher, standing 5 feet behind the home plate, throw to get the ball to second?

Find Brown's batting percentages in the following:

6. In 4 times at the bat in the first game he makes 1 hit.

The number of hits is what per cent of the number of times at the bat?

7. In 5 times at the bat in the second game he makes 2 hits.

8. In 3 times at the bat in the third he makes 1 hit.

9. In 2 times at the bat in the fourth he makes 2 hits.

10. Find his average for the four games.

The batting average is based upon the total times at the bat and the total hits.

11. In a series of games a first-baseman had 140 chances and made 20 errors. What is his average fielding percentage (percentage of successful plays) for the series?

12. In one game he had 12 chances with 3 errors. What is his fielding percentage for this game?

13. What in a game with 12 chances and 2 errors?

14. Find his average (percentage) for the 2 games.

Find the left-fielder's percentage in a and b:

a. In one game he had 15 chances with 2 errors.

b. In the next 16 chances with 3 errors.

c. What is the shortest outfield hit possible?

LIII. REVIEW

1. Find the cost of a chicken weighing 4 lb. 2 oz. @ 25¢.

2. How many square feet in a floor $10\frac{1}{3}$ ft. by $12\frac{1}{2}$ ft.?

3. In a school of 50 pupils 3 were absent. What per cent were present?

4. The pupils in a room use 15 doz. pencils in a year. How much will they cost @ $1.20 a gross?

5. A package of 25 envelopes stamped with 2-cent stamps costs 54¢. What will 1000 cost? How much of this is for the envelopes?

6. How many boards $3\frac{1}{2}$ in. wide are required to cover a space 2 ft. wide?

7. How much will 1200 lb. of hay cost @ $15 per ton?
What part of a ton is 1200 lb.?

8. $3\frac{1}{2}$ in. + $6\frac{8}{10}$ in. = x in. $12\frac{7}{8}$ yd. − $5\frac{2}{3}$ yd. = x yd.

a. Make a problem to find how many strips of carpet are needed for a room.

b. How many hills in 50 rows of corn, each containing 212 hills?

LIV. REVIEW

1. Find the cost of 24 geographies @ $62\frac{1}{2}$¢ each.

2. How many square feet in a lot 50 ft. by 96 ft.?

3. In a lane $33\frac{1}{3}$ ft. by 240 ft.?

4. What part of a yard is 27 in.? How many strips of carpet 27 in. wide are required for a room 6 yd. wide? For one 12 ft. wide?

5. How many boards $2\frac{1}{4}$ in. wide will cover a strip of floor 1 yd. wide?

6. How many miles of fence will inclose a lot $\frac{3}{4}$ mi. wide and $1\frac{1}{8}$ mi. long?

7. How many square yards in a rug $6\frac{2}{3}$ yd. long and $2\frac{1}{2}$ yd. wide?

a. $200\% \div 16\frac{2}{3}\% = x$ $316\frac{2}{3}\% \div 33\frac{1}{3}\% = x$
b. $12\frac{1}{2}\%$ of \$200 $= x$ $37\frac{1}{2}\%$ of 320 rd. $= x$
c. $83\frac{1}{3}\%$ of 12 yd. $= x$ $37\frac{1}{2}\%$ of 4 lb. $= x$ oz.

LV. MULTIPLICATION — DIVISION — EIGHTEENS

1. Beginning with 18, write the counts by 18's to 90, and backward to 18.

2. The second count is how many 18's? The third count?

3. Write the multiplication table of 18's from 36 to 8 18's.

4. Write the division table of 18's from 36 to 90.

LVI. POSTAGE

In United States Territory, Canada, and Mexico.

The rates to most other foreign territory are higher than those given below.

ON FIRST–CLASS MATTER, *including letters, sealed packages, and packages containing written matter other than the name of the sender*, the rate is **2¢ per ounce or fraction of an ounce.**

1. How much is the postage on a letter weighing ½ oz.?

2. On a sealed package weighing 9 oz.?

ON SECOND–CLASS MATTER, *including newspapers and periodicals*, the rate is **1¢ per pound or fraction of a pound when sent by the publisher or a news-agent**, and **1¢ for each 4 oz. or part of 4 oz. when sent by another** to one address.

3. How much is the postage on 600 lb. of newspapers sent by the publisher?

4. On 2 lb. 3 oz. of magazines sent by a news-agent?

5. On 2 lb. 3 oz. of magazines sent by you to one address?

ON THIRD–CLASS MATTER, *merchandise*, the rate is **1¢ per ounce or fraction of an ounce.**

6. How much is the postage on a package of dry-goods weighing 2 lb. 3 oz.?

7. On a package of seeds weighing 3 lb. 9 oz.?

ON FOURTH–CLASS MATTER, *books and printed matter other than newspapers and periodicals*, the rate is **1¢ for each 2 oz. or fraction of 2 oz.** sent to one address.

8. How much is the postage on a package of books weighing 3 lb. 9 oz.?

9. On a package of printed circulars weighing 1 lb. 13 oz.? On a package of seeds with written instructions inclosed, weighing 3½ oz.?

a. How much is the postage on a letter weighing $1\frac{1}{2}$ oz.?

LVII. REVIEW

1. How much is the postage on a boy's sweater weighing 2 lb.?

2. On 3000 lb. of newspapers mailed by the publisher?

3. On a book weighing 1 lb. 4 oz.?

4. On a package containing a doll and weighing 1 lb. 4 oz.?

5. On a magazine weighing 1 lb. 4 oz., forwarded by a postmaster?

6. A map of a city $8\frac{1}{2}$ mi. long is drawn to a scale of $2\frac{1}{2}$ in. to 1 mi. How long is the map?

7. How much will 16 music-books @ 35¢ cost?

8. How much will 99 sq. ft. of slate blackboard cost @ 28¢ per square foot?

9. $2\frac{7}{8}$ in. $+ \frac{3}{16}$ in. $= x$ $2\frac{7}{8}$ in. $- \frac{3}{16}$ in. $= x$

10. $2\frac{7}{8}$ in. $\div \frac{3}{16}$ in. $= x$ $\frac{1}{2}$ of $2\frac{7}{8}$ in. $= x$

a. $87\frac{1}{2}\%$ of 1 ft. $= x$ in. $37\frac{1}{2}\%$ of 5 lb. $= x$ oz.

b. Find the cost of 63 bicycles @ $25?

c. Of 82 harnesses @ $12.50. Of 102 pairs of shoes @ $2.00.

LVIII. LENGTH — MEASURING A MILE

If the class have not already measured a mile, it will be well to select a familiar and convenient street, and starting at a point near the school, measure a mile along this street.

It will be convenient for two pupils to work together in the measuring. Each two get a strong string 5 rods and 2 feet long, which will not stretch much. Tie a knot in the string 1 foot from each end. How long is the string between the knots?

One pupil hold the knot at one end of the line at the starting point. The other stretch the line straight in the direction to be measured, and mark the end of the 5 rods. If the street is paved, the marking may be with crayon.

If not paved, a few wire nails or skewers may be used for marking the lengths, the pupil in advance sticking one into the bed of the street opposite the knot, and the one in the rear taking it when the next 5 rods have been measured and marked. It will be well to mark the end of each quarter mile in some more permanent way.

Each pupil should practise walking with even step over a 5-rod distance, counting his steps. He can then, by counting his steps, learn approximately how far he walks to school.

LIX. POSTAGE — REVIEW

FOR REGISTERED MATTER the cost is **10¢ in addition to the regular postage.**

FOR SPECIAL DELIVERY letters or packages the rate is **10¢ in addition to regular postage.**

1. How much is the postage on a registered letter weighing 1 oz.?

2. On a special delivery sealed package weighing 7 oz.?

3. On a registered package of dry-goods weighing 29 oz.?

4. On a registered package of books weighing 1 lb. 13 oz.?

5. On a registered package of magazines, sent by you and weighing 1 lb. 13 oz.?

6. Find the cost of 18 cows @ $55 each.

Use factors in multiplying.

7. How many square yards in a floor 1 rd. by 15 ft.?

Think the dimensions in yards.

8. On a scale of $\frac{1}{16}$ in. to 4 ft., draw a line to represent a length of 44 ft.

9. Draw $\frac{1}{2}$ of $\frac{3}{4}$.

Draw a square, divide it into fourths, shade 3 of them, divide each fourth into 2 equal parts, and shade half of each of the 3 fourths by lines running across the other shade lines.

a. Draw $\frac{5}{6}$ of $\frac{1}{2}$.

b. Find the cost of 500 boxes of oranges @ $2.50.

c. Draw a rectangle 3½ in. by 2¼ in., divide it into inch squares, and write the number of square inches which it contains.

LX. PERCENTAGE — REVIEW

1. 12½% of 1 mi. = x rd. 37½% of 1 mi. = x rd.
2. 62½% of 1 mi. = x rd. 16⅔% of 1 ft. = x in.
3. 87½% of 1 gal. = x pt. 16⅔% of 1 yd. = x in.
4. 6¼% of 1 mi. = x rd. 37½% of 40 bu. = x qt.

Compare this with 1 above.

5. Find 33⅓% of 960 votes. 3 % of 1200 pupils.
6. How much is 65% of $10,000?

a. What per cent is 1 qt. of ⅝ gal.?

b. Find the cost of 9½ yd. of velveteen @ 98¢.

c. A salesman received $10 in payment for 5⅜ yd. of cheviot @ $1.00. How much change should be given?

d. A 2-inch square is what per cent of a rectangle 2 in. by 4 in.?

LXI. TO FIND WHAT PER CENT ONE QUANTITY IS OF ANOTHER

What per cent is:

1. 1 pt. of 3 qt.? 3 qt. of 1 gal.? 1 qt. of 1 gal.?
2. 1 pt. of 1 gal.? 1 gal. of 1 pt.? 1 ft. of 1 yd.?
3. 1 yd. of 9 in.? 9 in. of 1 yd.? 2 ft. of 1 yd.?
4. 18 in. of 1 ft.? 2 ft. of 18 in.? 4 oz. of 1 lb.?
5. 8 oz. of 3 lb.? 2 lb. of 8 oz.? 100 lb. of 1 ton? A ton of 500 lb.?

a. 1 yd. of 2 rd.? 6 in. of 1 yd.?

b. 5 min. of 8 h.? 1 h. of 20 min.?

c. 30° of a right angle? A circle of 360°?

LXII. REVIEW — MAKING CHANGE

1. A house-furnishing store began the day with 2 twenty-dollar bills, 4 tens, 6 fives, 10 twos, and 20 ones. How much paper money had they?

2. They also had 20 halves, 20 quarters, 50 dimes, 100 nickels, and 200 cents. How much coin had they?

3. How much of paper and coin together?

4. Suppose you are selling stamps in a post-office. You sell 20 twos, 20 ones, and a special; and receive $1.00. How much change do you give?

5. You sell 10 twos, 10 ones, and 25 postals; and take a half and a quarter. How much change?

6. You sell stamps for a package of dry-goods weighing 2 lb. 2 oz., and take 50¢. How much change?

7. Suppose you are a salesman in a market. You sell 5 lb. 2 oz. of lamb @ 18¢, and take $1.00. How much change?

In the final cost consider ½ or a greater part of a cent as a whole cent, and do not count a part less than ½¢.

8. You sell 2 lb. 2 oz. of ham @ 25¢, and receive $1.00. How much change?

9. You sell 6 lb. 4 oz. of corned beef @ 18¢, and receive $2.00. How much change?

10. You sell 3 lb. 8 oz. of sirloin steak @ 35¢, and receive $2.00. How much change?

a. An automobile covering 40 rd. in 15 seconds, goes how many rods a minute? It goes a mile in what time? At this rate how many miles would it go in an hour?

b. At a speed of 24 mi. an hour, how long does it take a cruiser to go a mile? How long to go 1½ miles?

c. A 6-inch square is what per cent of a foot square?

d. A foot square is what per cent of rectangle 2 ft. by 4 ft.?

LXIII. TIME — REVIEW

1. How many hours and minutes from 1.10 to 4.30, from 4.23 to 6.48?

2. From 11.20 A.M. to 2.55 P.M., from 1.55 to 4.08?

3. From 7 A.M. to 4.20 P.M.; omitting 1 hour at noon?

4. How much does Mrs. A earn by working from 8 o'clock to 11.48 @ 20¢ an hour?

5. A carpenter can build a rod of fence in 2 hours. How long will it take him to build a fence round a lot 4 rd. by 3 rd.?

6. A plumber is absent from the shop from 2.10 to 4.50 to repair a water-pipe. How much should the charge be @ 60¢ per hour?

7. A floor is 15 ft. wide. How many strips of carpeting $\frac{3}{4}$ yd. wide are required to cover it?

If a part of a strip is needed, a whole strip must be purchased.

8. Anna lives 70 rd. north of the schoolhouse, and Dorothy 90 rd. south. What part of a mile apart do they live?

a. A carpenter works from 8 A.M. to 3.15 P.M., excepting 1 h. at noon. How much does he earn @ 45¢ an hour?

b. Fred rode on his wheel 40 rd. in 30 seconds. At that rate how long would it take him to ride a mile? This rate equals how many miles an hour?

c. An automobile going 30 miles an hour would be how long in covering 80 rd.?

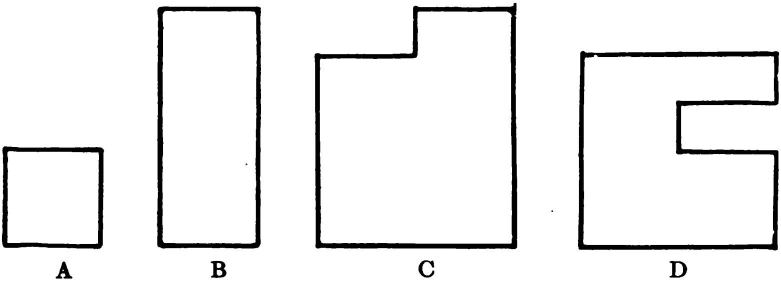
LXIV. MULTIPLICATION — DIVISION — TWENTIES

1. Beginning with 20, write the counts by 20's to 240, and backward to 20.

2. Write the multiplication table of 20's to 12 20's.

3. Write the division table of 20's to 240.

LXV. COMPARISON — SURFACE — FRACTIONS



Think all these exercises with the eyes upon the diagram.

Take A *as* 1:

1. How much is B? C? D?

2-3. $B + D = x$ $C + D = x$ $C \div B = x$ $D \div B = x$

Take B *as* 1:

4. How much is A? C? D?

5-6. $C - D = x$ $C + D = x$ $C + A = x$ $C - A = x$

7-8. $C \div A = x$ $2D = x$ $D - A = x$ $D + A = x$

Take C *as* 1:

a. How much is B? A? D?

b. $A + B + D = x$ $A + B - D = x$

c. $B + D - A = x$ $A + D - A = x$

d. $D \div A = x$ $D \div B = x$

LXVI. MULTIPLICATION — DIVISION — TWENTY-FIVES

1. Beginning with 25, write the counts by 25's to 300, and backward to 25.

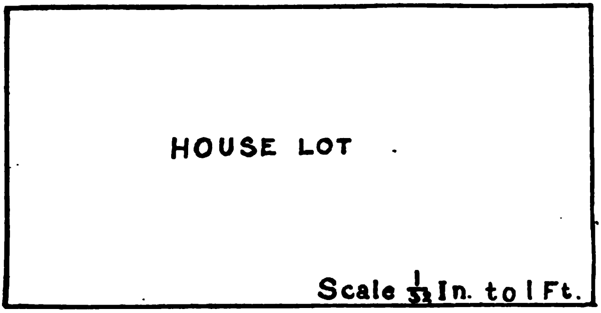
2. Write the multiplication table of 25's to 12 25's.

3. Write the division table of 25's to 300 = 12 25's.

4. Find the cost of 50 caps @ 75¢.

5. How many hats @ 25¢ each will $17 buy?

LXVII. REVIEW



1. How many feet wide is the lot shown in the above plan?

2. How many feet long is it?

3. How many square feet in it? How do you know?

4. How much is it worth @ 10¢ per square foot?

5. How many running feet (feet in length) of fence are required to inclose it?

6. How much will the fence cost @ 20¢ per running foot?

7. How many yards long are the two ends of the lot?

8. How much postage is required for a package containing spectacles and weighing 6 oz.?

9. $2\frac{5}{6}$ h. $+ 1\frac{1}{3}$ h. $= x$ h. $2\frac{5}{6}$ h. $+ 81\frac{1}{4}$ h. $= x$ h. $5 \times \frac{17}{20} = x$

10. $2\frac{5}{6}$ h. $\div 1\frac{1}{3}$ h. $= x$ $\frac{3}{4}$ of $6\frac{1}{2} = x$ $\frac{10}{11} \div 5 = x$

a. $3\frac{1}{2}$ mi. $+ 1\frac{9}{16}$ mi. $= x$ mi. $3\frac{1}{2}$ mi. $- 1\frac{9}{16}$ mi. $= x$ mi.

b. What per cent higher is $1.75 a day than $1.50?

c. If the hills of corn in a field form rows in two directions at right angles and the rows in each direction are 3 ft. 6 in. apart, how many square feet of land are required for each hill?

LXVIII. REVIEW

1. How many boards 5 in. wide will cover a space $2\frac{1}{2}$ ft. wide?

2. How many square feet in a lot 25 ft. by 88 ft.?

3. How many fence posts 10 ft. apart are required for a piece of fence 10 ft. long? For a piece 20 ft. long? For a piece 30 ft. long?

4. How many rods round a square 20 rd. on a side?

5. How many pints in $87\frac{1}{2}\%$ of a gallon?

6. How many pounds in $62\frac{1}{2}\%$ of a ton?

7. How many square yards in a rug $2\frac{1}{2}$ yd. by $1\frac{1}{2}$ yd.?

8. How many pencils in $66\frac{2}{3}\%$ of a gross (144)?

9. $\frac{3}{4}$ of $\frac{4}{5}$ mi. $= x$ $\frac{2}{3}$ of $1\frac{1}{2}$ mi. $= x$

10. $\frac{4}{5}$ mi. $\div$ $\frac{3}{4}$ mi. $= x$ $\frac{3}{4}$ mi. $\div$ $\frac{4}{5}$ mi. $= x$

a. How many trees can be set 25 ft. apart in a row 630 ft. long, with no tree within $12\frac{1}{2}$ ft. of the end of the row?

b. How many such rows would 300 trees set?

LXIX. REVIEW

1. At $6 per ton, how much will 500 lb. of coal cost? 250 lb.? 100 lb.?

2. $\frac{1}{3} + \frac{1}{2} + \frac{2}{5} = x$

3. I take 3 pt. of milk a day @ 8¢ a quart. How much is my bill for November?

4. What part of a day is it from midnight to 3 o'clock P.M.?

5. How many square feet in the four walls of a room 20 ft. by 22 ft. and 8 ft. high?

6. How many square inches are there in the top of a table 44 in. by 50 in.? 44 50's $= x$ 100's.

7. How many in the top of a table 43 in. by 99 in.?

8. In a school of 40 pupils 1 is absent. What per cent are present?

9. Find the cost of 46 lb. of honey @ 15¢.

a. A lot of land is 99 ft. by 165 ft. Change these dimensions to rods. How many square rods in the lot?

b. A plumber leaves the shop to repair a gas-pipe at 8.10, and returns at 10.40. How much should the charge be at 60¢ an hour?

c. If sound travels through air at the rate of 1080 ft. per second, about how far away is lightning which is seen 5 seconds before the thunder is heard?

d. One minute later lightning is seen in the same direction 3 seconds before the thunder is heard. How far away is it then?

LXX. WEIGHT — POUNDS — OUNCES

1. What part of a pound is 1 oz.? 3 oz.? 5 oz.? 11 oz.? 13 oz.? 15 oz.?

2. What part of a pound is 8 oz.? 4 oz.? 12 oz.?

3. 2 oz.? 6 oz.? 10 oz.? 14 oz.?

4. How much per ounce is 16¢ per pound? 32¢ per pound?

5. Find the cost of 6 lb. 3 oz. of beef @ 16¢.

6. Of 2 lb. 5 oz. of steak @ 32¢.

7. How much per ounce is 24¢ per pound? 20¢ per pound? 28¢?

8. Find the cost of 3 lb. 3 oz. of mackerel @ 24¢.

In the answer count a half or larger part of a cent as a whole cent, and a part less than a half as nothing.

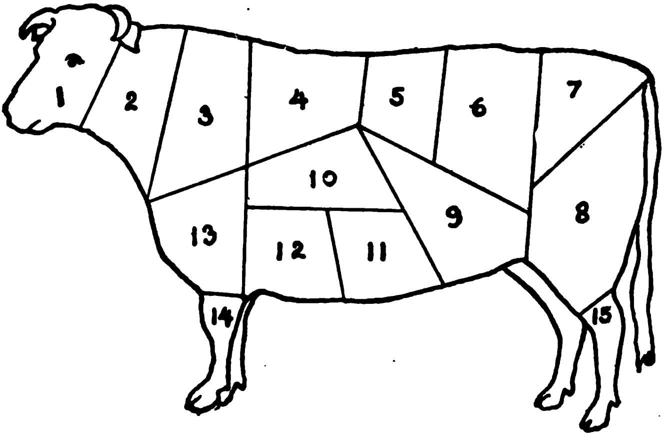
9. Find the cost of 5 lb. 1 oz. of fowl @ 20¢.

10. Of 10 lb. 5 oz. of chicken @ 28¢.

How much more than $\frac{1}{4}$ lb. is 5 oz.? How much will the $\frac{1}{4}$ lb. cost? 1 oz.?

a. Find the cost of 3 lb. 9 oz. of salmon @ 28¢.

LXXI. WEIGHT — POUNDS — OUNCES



This diagram shows into what pieces beef is cut; and the names of these parts, their approximate weights, and retail prices are indicated below.

1. Head, 15 lb. @ 6¢.
2. Neck, 25 lb. @ 8¢.
3. Chuck, 135 lb. @ 10¢ to 16¢.
4. Prime ribs, 60 lb. @ 19¢.
5. Porter-house steak, 80 lb. @ 30¢.
6. Sirloin steak, 35 lb. @ 28¢.
7. Rump steak, 30 lb. @ 28¢.
8. Round, 130 lb. @ 18¢ to 24¢.
9. Flank, 30 lb. @ 9¢.
10. Short ribs, 25 lb. @ 10¢.
11. Plate, 80 lb. @ 9¢.
12. Brisket, 75 lb. @ 15¢.
13. Shoulder clod, 60 lb. @ 16¢.
14. Shin, 40 lb. @ 7¢.
15. Shank, 22 lb. @ 6¢.

At the prices indicated above, find the cost:

1. Of 6 lb. 8 oz. of brisket.
2. Of 4 lb. 9 oz. of shank.

How much more than half a pound is 9 oz.? 7 oz. is how much less than ½ lb.?

3. Of 2 lb. 7 oz. of sirloin steak.
4. Of 5 lb. 12 oz. of prime ribs.
5. Of 1 lb. 13 oz. of porter-house steak.

How much less than 1 lb. is 13 oz.? It will cost how much less than 1 lb.?

6. Of 4 lb. 11 oz. of chuck @ 12¢.

7. Of 6 lb. 5 oz. of rump for pot-roast.

5 oz. is how much more than $\frac{1}{4}$ lb.? 3 oz. is how much less than $\frac{1}{4}$ lb.?

8. Of 2 lb. 3 oz. of round for pot-roast @ 20¢.

a. Of 5 lb. 7 oz. of swordfish @ 22¢.

b. Of 1 lb. 3 oz. of mercury @ 80¢.

LXXII. WEIGHT — VALUE — FRACTIONS

1. Find the cost of 6 lb. 7 oz. of lamb @ 18¢.

2. Of 1 lb. 9 oz. of lamb chops @ 25¢.

3. Of 4 lb. 2 oz. of chicken @ 30¢.

4. Of 3 lb. 6 oz. of chuck @ 15¢.

5. Of 2 lb. 10 oz. of halibut @ 24¢.

6. Of 1 lb. 14 oz. of rump steak @ 30¢.

What part of a pound is 14 oz.? It lacks what part of being a pound?

7. Of 2 lb. 2 oz. of round @ 22¢.

8. Of 4 lb. 5 oz. of fowl @ 22¢.

a. Of 5 lb. 9 oz. of pork @ 18¢. Of 3 lb. 14 oz. of cod @ 18¢.

LXXIII. REVIEW

1. $\frac{1}{3} = x\%$ of $\frac{1}{2}$ $\frac{1}{2} \div \frac{1}{3} = x$

2. $\frac{1}{4}$ of $\frac{2}{3} = x$ $\frac{2}{3} - \frac{1}{4} = x$

3. Find the cost of 4 lb. 12 oz. of corned brisket @ 18¢.

4. Of 5 lb. 5 oz. of sirloin roast @ 25¢.

5. How much should be received for 24 cans of milk @ 45¢?

6. How much will $16\frac{2}{3}$ yd. of carpeting cost @ $\$1\frac{1}{2}$?

7. Ned earns $8 a week, and spends $4.50 for board and $2.25 for other things. How much does he save per week? How much in 10 weeks?

8. At the rate of 10 lb. of sweet potatoes for 25¢, how much is paid per pound?

a. Which is cheaper, and how much, a dozen bananas for 20¢, or 16 for 25¢?

b. Find the cost of 500 stamped envelopes @ 54¢ per package of 25.

c. A teacher's salary is $500 per year of 40 weeks. How much should she receive for 5 weeks' service?

d. Sweet potatoes @ 50¢ per bushel (60 lb.) cost how much per pound?

LXXIV. REVIEW

1. A half pint is what part of a gallon?

2. 400 lb. = $x\%$ of 1 T.

3. How many square feet in the ceiling of a room 18 ft. by 25 ft.?

4. How much postage is required for a registered letter weighing $1\frac{1}{2}$ oz.?

5. If $1.00 were given in payment for the stamps for this letter, what coins would be best for change?

6. How much will 9 washing machines cost @ $5.50?

7. How much postage is required for a newspaper weighing 4 oz. sent by you?

8. Find the cost of 6 lb. 13 oz. of sirloin beef @ 24¢.

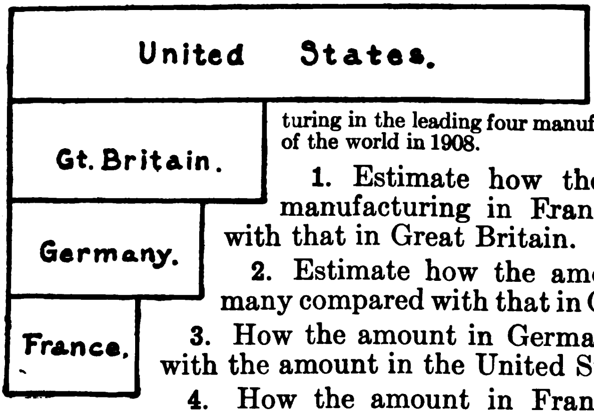
a. A lot of land 6 rd. by 10 rd. is what per cent of an acre?

b. By measuring upon a map and using the scale of miles, find the approximate distance by water from Providence, R. I., to Norfolk, Va.

c. In the same way find the distance from Tampa, Fla., to New Orleans.

d. A train running 40 mi. an hour will be how long in going 220 mi.?

LXXV. COMPARISON — FRACTIONS — PERCENTAGE



These rectangles represent approximately the relative values of manufacturing in the leading four manufacturing countries of the world in 1908.

1. Estimate how the amount of manufacturing in France compared with that in Great Britain.

2. Estimate how the amount in Germany compared with that in Great Britain.

3. How the amount in Germany compared with the amount in the United States.

4. How the amount in France compared with that of the United States.

5. How the amount in Great Britain compared with that of the United States.

6. How the amount in France compared with that in Germany.

7. How the amount in France, Germany, and Great Britain together compared with that of the United States.

Use the rule in testing these estimates.

8. The manufactures of Germany amounted to what per cent of those of the United States?

a. The manufactures of France amounted to about what per cent of those of the United States?

b. Those of Great Britain equalled about what per cent of those of the United States?

c. Those of France and Germany amounted to about what per cent of those of the United States?

d. Those of France and Great Britain amounted to about what per cent of those of the United States?

LXXVI. TIME — VALUE

1. A teacher's salary was $600 for the school year of 40 weeks. How much was she entitled to for teaching 4 weeks?

2. How much for 1 week? For 3 weeks? For 5 weeks?

3. For 1 day? For 3 days?

4. For 3 weeks and 4 days? For 3 weeks and 2 days?

5. Another teacher whose annual salary is $1500 is entitled to how much for 4 weeks? For 1 week? For 1 day? For $1\frac{4}{5}$ weeks?

6. One whose annual salary is $900, is entitled to how much for teaching 4 weeks? For 1 week? For 3 weeks?

a. A janitor receives $\frac{1}{12}$ of his annual salary of $800 for each calendar month. How much does he receive for each month?

b. How much for June if he resigned at the end of the 10th day?

c. How much should his successor receive for June?

LXXVII. REVIEW

1. How many square feet in the floor of a room $20\frac{2}{3}$ ft. long and 12 ft. wide?

2. If this room were $12\frac{1}{2}$ ft. wide, how many square feet would it contain?

3. How many square feet in a door $6\frac{2}{3}$ ft. high and 2 ft. wide?

4. How many more square feet would it contain if it were $\frac{2}{3}$ ft. wider?

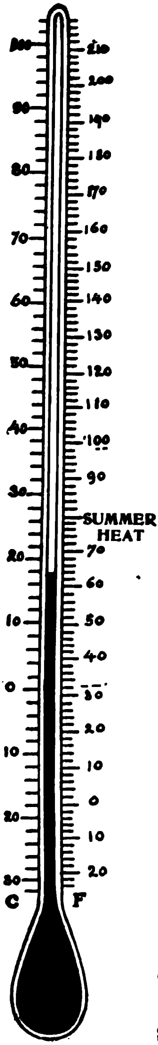
5. How many square feet in a door $6\frac{2}{3}$ ft. by $2\frac{2}{3}$ ft.?

6. 25% of $\frac{3}{8} = x$ $\qquad$ 75% of $\frac{2}{3} = x$

Change per cents to fractions.

7. Find the cost of 4 lb. 6 oz. of shin beef @ 8¢.

LXXVIII. THERMOMETER SCALE



The thermometer in common use in the United States has the Fahrenheit scale, shown on the right in the diagram.

1. On this scale how many degrees is 0 from the freezing-point of water? Above, or below?

2. How many degrees above 0 is the boiling-point of water?

3. How many degrees above the freezing-point?

4. How many degrees is "blood heat" above 0?

5. How many degrees is "blood heat" above the freezing-point of water?

6. On a certain night the temperature went down to 18° below 0. How many degrees below the freezing-point is that?

7. The temperature indicated in the diagram is how many degrees above the freezing-point?

8. "Blood heat" on the scale indicates the temperature of the human body in health. The temperature of a fever patient was 103°. How much above the normal temperature was that?

9. The temperature at 5 A.M. was 7° below 0. At 2 P.M. it was 40° above. How much had it risen?

10. The average January temperature in the coldest part of Siberia is 60° below 0. In Manila it is 80° above. What is the difference in temperature?

The Centigrade thermometer scale is shown on the left of the tube.

a. Zero on the Centigrade scale corresponds to what on the Fahrenheit?

b. 100° of the Centigrade scale equals how many degrees of the Fahrenheit? 10° of Centigrade equals how many of Fahrenheit? 1° of Centigrade?

c. A temperature of 10° above 0 Centigrade is equivalent to what temperature Fahrenheit?

LXXIX. REVIEW

1. $\frac{3}{4} - \frac{1}{6} = x$ $33\frac{1}{3}\%$ of $33\frac{1}{3}\% + \frac{2}{9} = x$

2. A work horse is used from 9 A.M. to 2.30 P.M., except an hour at noon time. How much should be paid for the use of him @ 20¢ an hour?

3. What date is 2 weeks and 3 days after August 19?

4. How many square feet in a strip of land $6\frac{1}{2}$ ft. by 50 ft.?

5. How much will 25 lb. of ice cost @ 60¢ per 100 lb.?

6. How much will a jar of cream a day for a week cost @ 15¢ per jar?

7. At the rate of $1.50 for a day of 9 hours, how much will the labor of a man for 4 hours cost?

8. How much will 2 lb. 3 oz. of ham cost @ 25¢?

a. A woman works from 8.15 A.M. to 5 P.M. @ 20¢ per hour. How much does she earn?

b. Henry buys shoes for $3.50, 4 collars at the rate of 2 for 25¢, and 3 pairs of hose @ 25¢. He gives a 10-dollar bill in payment. How much change should he receive?

c. If 10 per cent of milk is cream, and milk costs 7¢ per quart, how much will be the cost of milk enough to get a quart of cream?

d. How much will a quart of cream cost @ 15¢ per half pint?

LXXX. REVIEW

1. How much is the postage on a registered package of magazines weighing 1 lb. 10 oz., sent by you?

2. On a registered package of books of the same weight?

3. On a registered package of toys of the same weight?

4. On a registered letter weighing $\frac{1}{2}$ oz.?

5. Find the cost of 5 lb. 12 oz. of lamb @ 15¢.

6. Of 1500 lb. of coal @ $7 per ton.

7. Suppose $10 is given in payment for the coal. Name in the best order the best pieces of money for change.

8. A farm is sold for $4200, of which $500 is paid in cash. How much is still unpaid?

9–10. A mortgage note for $2150 is given in part payment. How much more is due? A second mortgage note is given to complete the payment. For how much is this note given?

a. Find the cost of 25 sewing-machines @ $22.

b. $87\frac{1}{2}\%$ of $\frac{4}{5} = x$ $\frac{2}{3}$ of $1\frac{1}{5}$ T. $= x$ lb.

c. How much land is there in a strip a rod wide and a half mile long?

LXXXI. REVIEW

1. How many square rods in a field 22 rd. by 35 rd.?

2. How many in a field 24 rd. by $66\frac{2}{3}$ rd.?

Think $66\frac{2}{3}$ rd. as a fraction of 100 rd.

3. How many acres in this field?

4. A smokes an average of 2 10-cent cigars per day. How much does his supply for a year cost?

5. How much would it cost for 20 years?

6. How many years since the settlement of Jamestown, Va.?

7. How many hours and minutes does it take a train going 40 miles an hour to go 70 miles?

8. A street-car makes 15 round trips a day, and averages 20 5-cent fares each way. What do the fares for a day amount to?

9. How many square rods in a lot $22\frac{1}{2}$ rd. by 10 rd.?

a. Find the cost of 6 lb. 5 oz. of beef flank @ 9¢.

b. Of 3 lb. 7 oz. of shank @ 6¢.

c. How many square feet in the floor of a room 15 ft. 6 in. by 20 ft. 8 in.?

d. In a wall $8\frac{1}{2}$ ft. by 16 ft. 8 in.?

LXXXII. LUMBER MEASURE

It would be well to get from some one who is erecting a frame building pieces of lumber of as many of the following dimensions as possible: 1 in. (or less) thick and 12 in. wide, 2 in. by 12 in., 2 in. by 4 in., 2 in. by 6 in., 2 in. by 8 in., 3 in. by 12 in., 3 in. by 4 in., 3 in. by 6 in., 3 in. by 8 in., 4 in. by 8 in., and 6 in. by 8 in.

The boys can mark these pieces with pencil and square, and saw them off 1 ft. long.

The pupils should examine the pieces so that they can give their dimensions without measuring.

The quantity of lumber contained in a piece of board a foot square and an inch thick is a board foot. A piece a foot square and 2 in. thick contains 2 board feet. One a foot square and $1\frac{1}{2}$ in. thick contains $1\frac{1}{2}$ board feet. **A piece a foot square and less than an inch thick is also reckoned as a board foot**; but thin boards usually sell at lower prices per foot.

1. A piece of inch board a foot long and 6 in. wide contains what part of a board foot?

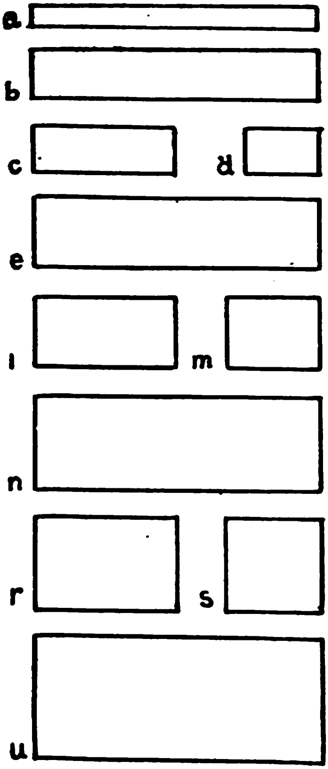
2. A piece a foot long and 3 in. wide contains what part of a board foot?

3. A piece a foot long and 9 in. wide?

4. A piece a foot long and 4 in. wide?

5. A piece a foot long and 8 in. wide?
6. A piece a foot long and 2 in wide?
7. A piece a foot long and 10 in. wide?
8. How many board feet in a piece a foot square and 2 in. thick?
9. In a piece a foot square and 1½ in. thick?
10. In a piece a foot square and 1¼ in. thick?

a. In a piece 8 in. wide, 12 ft. long, and 1 in. thick?



LXXXIII. LUMBER MEASURE

The diagram shows end views of boards and joists. To find width and thickness, measure and use scale. The scale is ⅛.

How many board feet in a piece of:

1. *a* 1 ft. long? 8 ft. long?
2. *b* 1 ft. long? 8 ft. long?
3. *c* 1 ft. long? 12 ft. long?
4. *d* 1 ft. long? 16 ft. long?
5. *e* 1 ft. long? 14 ft. long?
6. *i* 1 ft. long? 12 ft. long?
7. *m* 1 ft. long? 14 ft. long?
8. *n* 1 ft. long? 26 ft. long?
9. *r* 1 ft. long? 16 ft. long?
10. *s* 1 ft. long? 18 ft. long?

Review these problems.

a. How many board feet in a sill as thick as *n*, ⅔ as wide, and 24 ft. long?

b. In 12 joists, each 2 in. by 3 in. by 8 ft.?

LXXXIV. LUMBER MEASURE

1. How many board feet in a board 1 in. by 6 in. by 8 ft.?

What part of a board foot in a piece 1 in. by 6 in. by 1 ft.?

2. How much will it cost @ $50 per 1000 ft.?

$50 per 1000 ft. = x¢ per foot.

3. How many feet in a plank $1\frac{1}{2}$ in. by 8 in. by 12 ft.?

4. Find the cost of this @ $60 per M (1000 ft.).

$60 per M = x¢ per foot.

5. How many feet in a board $\frac{1}{2}$ in. by 8 in. by 12 ft.?

6. Find its cost @ $45 per M.

$45 per M = x¢ per foot.

7. How many feet in 2 joists, each 6 in. by 6 in. by 23 ft.?

8. Find the cost @ $30 per M.

9. How many feet in 4 joists, each 2 in. by 6 in. by 10 ft.?

10. Find the cost of 15,000 ft. of lumber @ $28 per M.

Think this as 10,000 ft. and 5000 ft.

a. At 34¢ a pound, how much will 2 lb. 3 oz. of butter cost?

LXXXV. LUMBER MEASURE

1. How many board feet in joists 2 in. by 4 in. to make 100 ft. in length? Find the cost of this @ $30 per M.

2. How many board feet in joists 2 in. by 4 in. to make 2 stringers, one above the other, for a fence 100 ft. long?

3. Add 10 ft. to the above for loss in splicing pieces, and find the cost @ $20 per M.

4. How many feet of boards are required to make this fence 3 ft. 6 in. high?

5. Find the cost of these boards @ $40 per M.

Those who handle and use lumber commonly use the expression "feet," "feet of boards," or "feet of lumber," instead of "board feet."

6. At 2¢ each, what would be the cost of pickets to make the above fence if 5 pickets make 2 running feet of fence?

a. Find the number of square feet in the top of a table 3 ft. 6 in. by 5 ft. 4 in.

b. How large must a table cloth be to cover the above table and drop 9 in. on all sides?

c. How many times is $\frac{2}{3}$ of $\frac{1}{4}$ contained in $\frac{3}{5}$?

LXXXVI. REVIEW

1. How many feet (board feet) in a plank 2 in. by 8 in. by 6 ft.?

2. How many strips of carpeting 27 in. wide must be purchased for a room 18 ft. wide?

If part of a strip is needed, the whole strip must be purchased. Think these widths as yards.

3. If the above room is 24 ft. long and the strips are cut 6 in. longer than the room, how many yards of carpeting are required?

4. $2\frac{1}{2} \times \frac{5}{6} = x$ $\qquad$ $\frac{5}{6}$ of $2\frac{1}{2} = x$

5. A carriage was bought for $72 and sold for $84. The gain is what per cent of the cost? This is called the **gain per cent.**

6. A house which cost $2500 was sold for $2250. What per cent was lost?

7. Find the cost of a turkey weighing 10 lb. 14 oz. @ 24¢.

How much less than a pound is 14 oz.?

8. How many board feet in a board 9 in. by 16 ft.?

9. A teacher's salary was $720 per year, and was increased $16\frac{2}{3}\%$. How much was it then?

10. Find the cost of 25 sheets of Japanese tracing paper @ $4 per ream of 500 sheets.

a. How much will 3 lb. 7 oz. of steak cost @ 30¢?

LXXXVII. REVIEW

1. A bushel of wheat weighs 60 lb. A ton equals how many bushels?

To make the work easier, divide both divisor and dividend by 10.

2. How many board feet in a plank 8 in. by 2 in. by 12 ft.?

3. Find the postage on a package of dry-goods weighing $2\frac{1}{2}$ lb.

4. On a package of books weighing $2\frac{1}{2}$ lb.

5. How many square feet in a floor $15\frac{1}{2}$ ft. by 20 ft.?

6. $\$7.64 + \$1.95 = x$ 322 ft. − 97 ft. $= x$

How much does 95 lack of 100?
What is the easiest way to add 95, or 195? To subtract them.

7. A restaurant buys milk @ 8¢ a quart, and sells it @ 5¢ per glass ($\frac{1}{2}$ pt.). How much is received per quart? The gain is what per cent of the cost?

8. A man with a pair of horses works at the rate of $4 per day of 9 hours. This is how much per hour?

9. A rug $2\frac{1}{2}$ yd. wide is placed in the middle of a floor 4 yd. wide. How much width of floor is left uncovered on each side?

10. Find the cost of $40\frac{1}{2}$ yd. of carpeting @ $\$1\frac{1}{4}$ a yard?

a. How much will a man earn in 2 d. and 2 h. @ $4 per day of 9 h.?

b. How many hours and minutes from 2.12 A.M. Monday to 1.30 P.M. Tuesday?

LXXXVIII. MULTIPLICATION — DIVISION — SEVENTEENS

1. Beginning with 17, write the counts by 17's to 102, and backward to 17.

2. Write the multiplication table of 17's from 34 to 102.

3. Write the division table of 17's from 34 to 102.

LXXXIX. COMMISSIONS

1. A commission merchant sells 100 baskets of string beans for another party @ 40¢ per basket. How much was received for them?

2. The commission merchant keeps 5% of the money received to pay him for selling them. This is called his **commission.** How much is the commission?

The commission is what part of 10%?

3. There is an expense of 10¢ a basket for freight on the beans. How much does the freight amount to?

4. The commission and freight together amount to how much?

5. After taking out the commission and freight, how much of the money received for the beans is left for the one who shipped the beans to be sold? This part is called the **proceeds** of the sale.

6. A commission house sells 100 bl. of apples @ $1.60. How much is received for them? How much is the commission @ 5%?

7. Freight and carting costs 25¢ a barrel. This expense and the commission amount to how much?

8. How much are the proceeds of the sale?

a. Find the proceeds from 200 boxes of grapefruit sold @ $3 on commission of 5%, with freight charges of 50¢ a box.

9. How much does a commission merchant receive for 100 crates of tomatoes sold @ $1.50?

10. How much is his commission @ 5%?

11. How much does the freight cost @ 20¢ per crate?

12. How much are the proceeds?

13. Find the commission @ 5% on 200 bl. of potatoes sold @ $4.

14. Find the cost of freight on the potatoes @ 50¢ per barrel.

XC. REVIEW

1. Find the proceeds of 100 crates of peaches sold @ $2 on commission of 5%, with freight expenses of 20¢ per crate.

2. Of 100 bushel crates of muskmelons sold @ $2 on commission of 5% with freight expense of 50¢ per crate.

3. Find the cost of 800 bu. of corn @ 62½¢ less 2% for cash.

4. Find the cost of 7 lb. 9 oz. of lobsters @ 20¢.

5. How many board feet in a joist 4 in. by 6 in. by 12 ft.?

6. How high is a standard cubic yard? Into how many horizontal slices 6 in. thick could it be cut?

7. How many square yards of ground will a cubic yard of soil cover 6 in. deep?

8. How many cubic yards of soil are required to cover a lot 30 ft. by 90 ft., 6 in. deep?

Think the dimensions in yards.

9. How many cubic yards would cover the lot 3 in. deep?

10. How many cubic feet of air will a school room 25 ft. by 32 ft. by 10 ft. contain?

11. This equals how many cubic feet for each of 40 pupils?

12. If $\frac{1}{5}$ of the air is oxygen, how many cubic feet of oxygen does the room contain?

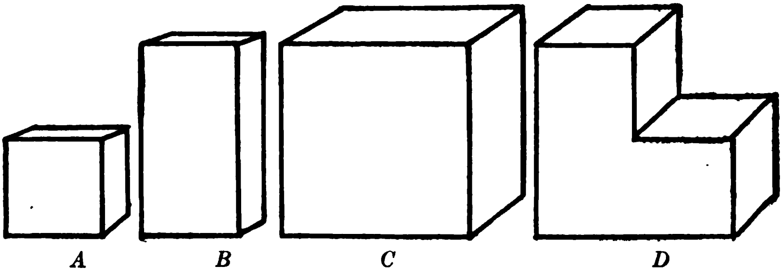
a. How many fence posts 8 ft. 3 in. apart are required for a fence 20 rd. long?

How many posts are required for a fence 1 rd. long? For a fence 2 rd. long? For a fence 3 rd. long?

b. How much are the proceeds from 100 bl. of squashes sold @ $2.50 on commission of 5% with freight charges of 75¢ per barrel?

c. Find the cost of 18 yd. of carpet @ $1.25.

XCI. COMPARISON — VOLUME — FRACTIONS



Take A as 1:

1. How much is *B?* *C?* *D?* What per cent is *B?* *C?* *D?*

2. $B + C = x$ $C + D = x$

Take C as 1:

3. How much is *A?* *B?* *D?* What per cent is *A?* *B?* *D?*

4. $A + D = x$ $C + D = x$

5. $A + D - B = x$ $A + B + D = x$

a. How large a square equals 25% of an 8-inch square?

b. How large a square equals $\frac{1}{9}$ of a 6-inch square?

XCII. COMPARISON — VOLUME — FRACTIONS — REVIEW

Take D as 1:

1. How much is *A?* *B?* *C?* What per cent is *A?* *B?* *C?*

2-3. $A + B + C = x$ $4A + 4B + C = x$

4. $3C - 2B - A = x$

5. Find the proceeds of 100 barrels of russet apples sold @ $4.50 with commission of 5% and freight charges of 25¢ per barrel.

6. How much will a white-wood board 8 in. wide and 6 ft. long cost @ 7¢ per foot?

a. A 6-inch cube equals in volume a block 2 in. thick, 6 in. wide, and how long?

XCIII. REVIEW

1. Find the proceeds of 100 crates of peppers sold @ $2 on commission of 5% with freight charges of 40¢ per crate.
2. How much will 3 pk. of apples cost @ 85¢ per bushel?
3. $\frac{2}{3}$ of $\frac{1}{2} = x$ $2\frac{1}{2} \times \frac{2}{3} = x$ $2\frac{1}{2} \div \frac{2}{3} = x$
4. How many board feet in a board 10 in. wide and 12 ft. long?
5. Find the cost of 2 lb. 2 oz. of steak @ 35¢.

a. A bushel of potatoes weighs 60 lb. How much will a ton cost @ 60¢ per bushel?

b. A typewriter writes 50 words a minute and averages 1 error an hour. The number of errors equals what per cent of the number of words written?

XCIV. TRADE DISCOUNT

In some lines of trade it is customary to take off a certain per cent of the list price of the goods when sold in quantity. **The part deducted is called the discount. The remainder is called the net price.**

Find the cost:

1. Of 4 Fun Primers @ 25¢ less $16\frac{2}{3}$%.
2. Of 16 Sunbonnet Babies @ 30¢ less 25%.
3. Of 6 Nichols Arithmetics @ 30¢ less $16\frac{2}{3}$%.
4. Of 4 Hawthorne's "Grandfather's Chair" @ 50¢ less 15%.

5. Of 25 Cyr's Fourth Readers @ 60¢ less $16\frac{2}{3}\%$.

6. Of 20 Shaw's Discoverers and Explorers @ 45¢ less 20%.

7. A man's tax is \$30. A discount of 4% of this is allowed for prompt payment. Find the discount and the net tax.

8. Sometimes two discounts are allowed, one on the list price and a second on the remainder after the first discount is deducted. Find the cost of a case of glass @ \$6 less $33\frac{1}{3}\%$ and 10% (of the remainder).

a. On a scale of $\frac{1}{8}$ in. to 1 rd., how long should the plan of a field 80 rd. long be?

b. $1\frac{7}{8}$ in. ÷ $\frac{1}{4}$ in. = x $\frac{1}{4}$ of $1\frac{7}{8}$ in. = x

c. How many board feet in a plank 2 in. by 10 in. by 10 ft.?

XCV. INTEREST FOR ENTIRE YEARS AND EASY PARTS

If one needs a house, or land, or a carriage, to use and does not own it, he hires it from a person who owns more than he needs for his own use, and pays him for the use of it. In the same way people having a use for more money than they own hire from others, and pay for the use of it a certain per cent of the money loaned per year. **The money loaned is called the *principal*. Money paid for the use of it is called *interest*.**

Find the interest on:

1. \$1500 for 1 yr. @ 4% a year.

1% of \$1500 = x 4% of \$1500 = x.

2. \$ 200 for 9 m. @ 4%.

4% a year = x% for 3 m. = x% for 9 m.

3. \$2000 for 1 yr. 9 m. @ 4%.

4. \$2500 for 1 yr. @ 3%.

5. \$2500 for 1 yr. 4 m. @ 3%.

3% a year = x% for 4 m. = x% for 1 yr. 4 m.

6. \$2500 for 1 yr. 8 m. @ 3%.

7. \$1600 for 2 yr. 8 m. @ 3%. \$800 for 1 yr. @ 6%.
8. \$800 for 6 m. @ 6%. For 1 yr. 6 m. @ 6%.
9. \$1800 for 1 yr. 6 m. @ 6%.
  a. \$1200 for 1 yr. 10 m. @ 6%. \$900 for 1 yr. 2 m.
  b. \$600 for 2 yr. 9 m. @ 4%. \$450 for 1 yr. 3 m.

XCVI. REVIEW

1. Find the interest of \$625 @ 6% for 6 m. For 8 m.
2. Find the cost of 16 geographies @ 50¢ less 20%.
3. Of 40 arithmetics @ 25¢ less $16\frac{2}{3}$ per cent.
4. How much is the postage on a book weighing 12 oz.?
5. On a package of seeds weighing 12 oz.?
6. On a package of newspapers weighing 12 oz. mailed by you?
7. On a package of written matter weighing 12 oz.?
8. Find the cost of 4 lb. 2 oz. of lobster @ 20¢.
9. Of a half-inch board 14 in. wide and 12 ft. long @ 4¢ a foot.
10. Of $20\frac{2}{3}$ yd. of carpeting @ $\$1\frac{1}{2}$ per yard.
  a. Of 1800 lb. of hay @ \$12 per ton.
  b. Of 4200 lb. of coal @ \$7 per ton.
  c. Of 18 yd. of gingham @ 35¢ per yard.

XCVII. INTEREST FOR ANY TIME AT SIX PER CENT

Interest at 6 per cent:

1. For 12 m. (1 yr.) = $\frac{x}{100}$ of the principal
2. For 2 m. = $\frac{x}{100}$ of the principal
3. For 20 m. = $\left(\frac{x}{100}\right)$ $\frac{x}{10}$ of the principal
4. For 1 yr. 8 m. = $\frac{x}{10}$ of the principal
5. For 10 m. = $\frac{x}{2}$ of $\frac{1}{10}$ of the principal
6. For 5 m. = $\frac{x}{4}$ of $\frac{1}{10}$ of the principal

7. For 2 m. = $\frac{x}{100}$ of the principal
8. For 60 d. = $\frac{x}{100}$ of the principal
9. For 30 d. = $\frac{x}{2}$ of $\frac{1}{100}$ of the principal
10. For 1 m. = $\frac{x}{2}$ of $\frac{1}{100}$ of the principal
11. For 20 d. = $\frac{x}{3}$ of $\frac{1}{100}$ of the principal
12. For 40 d. = $\frac{x}{3}$ of $\frac{1}{100}$ of the principal
13. For 15 d. = $\frac{x}{4}$ of $\frac{1}{100}$ of the principal
14. For 45 d. = $\frac{x}{4}$ of $\frac{1}{100}$ of the principal
15. For 6 d. = $\left(\frac{x}{10} \text{ of } \frac{1}{100}\right) \frac{1}{1000}$ of the principal
16. For 3 d. = $\frac{x}{2}$ of $\frac{1}{1000}$ of the principal
17. For 2 d. = $\frac{x}{3}$ of $\frac{1}{1000}$ of the principal
18. For 1 d. = $\frac{x}{6}$ of $\frac{1}{1000}$ of the principal
19. For 12 d. = $\frac{x}{1000}$ of the principal

After correcting errors in this exercise, *learn what part of the principal the interest at 6% is for each time indicated here.*

Find the interest at 6% on:

a. \$2500 for 10 m., for 5 m. \$3000 for 1 m. for 15 d.
b. \$1200 for 12 d., for 18 d. \$1800 for 10 d., for 20 d.

XCVIII. INTEREST FOR ANY TIME AT SIX PER CENT

Find the interest at 6% on:

1. \$1825 for 2 m. \$2000 for 1 yr.
2. \$1865 for 20 m. \$ 975 for 1 yr. 8 m.
3. \$1200 for 10 m. For 5 m.
4. \$ 800 for 5 m. \$ 900 for 60 d.
5. \$1600 for 30 d. \$1500 for 20 d.

CXIX. INTEREST FOR ANY TIME AT SIX PER CENT

Find the interest at 6% *on:*

1. $ 900 for 40 d. $ 800 for 15 d.

2. $1600 for 45 d. $1200 for 6 d.

3. $1200 for 3 d. For 2 d.

4. $1200 for 1 d. For 5 d.

5. $ 800 for 1 yr. 8 m. For 2 m. 6 d.

a. $1200 for 2 m. 6 d. For 20 m. 6 d. $1200 for 22 m.

b. $900 for 1 yr. 10 m. For 1 yr. 10 m. 6 d. For 20 m. 12 d.

C. REVIEW

1. How many rods in 66 ft.? How many feet in 5 rd.?

2. How many square rods in a lot 66 ft. by 82½ ft.?

3. How many strips of carpeting 27 in. wide must be purchased for a room 21 ft. wide.

Think the width of the strip and the width of the room in yards.

4. How many strips of wall-paper 1⅔ ft. wide are required for 1 side of a hall 19 ft. long?

5. How much will 1600 lb. of coal cost @ $6 per ton?

What part of a ton is 1600 lb.?

6. Find the cost of 2 lb. 9 oz. of steak @ 25¢.

7. How many board feet in a plank 2 in. by 6 in. by 10 ft.?

8. Interest for 2 yr. 6 m. @ 4% equals how many hundredths of the principal? What part of the principal?

9. Find the interest of $660.90 for 2 yr. 6 m. @ 4%.

10. Of $2000 for 2 m. 6 d. @ 6%.

a. A corridor 12½ yd. by 2⅓ yd. contains how many square yards?

CI. REVIEW

1. Find the proceeds from 100 baskets of peas sold @ $1.25 on commission of 5%, with freight charges of 10¢ per basket.

2. How much are the proceeds from the sale of a house lot for $500 on commission of 10%?

3. How much is the postage on a newspaper weighing 3 oz. mailed by you?

4. On a book weighing 3 oz.?

5. On a package of ribbon weighing 3 oz.?

6. On a letter weighing 3 oz.?

7. What is the value of 120 A. of land at $45?

8. On a scale of 40 ft. to 1 in., how long a line should be drawn to represent a length of 120 ft.?

9. Find the cost of 80 geographies @ $1.25 less 20 per cent?

10. $\frac{5}{6} \div \frac{3}{4} = x$ $\frac{5}{6} - \frac{3}{4} = x$ $\frac{5}{6}$ of $\frac{3}{4} = x$

a. How many square feet in a blackboard 4 ft. 8 in. wide and 16 ft. 6 in. long?

b. How many square yards of plastering in the walls of a room 18 ft. by 24 ft., and 9 ft. high?

CII. INTEREST

Find the interest at 6% *on:*

1. $ 943 for 2 m. $300 for 10 d.
2. $1400 for 1 yr. 8 m. $600 for 22 m.
3. $ 800 for 18 m. $600 for 18 m.
4. $ 320 for 10 m. $960 for 60 d.
5. $ 960 for 30 d. For 20 d.

a. Find the length and width of a plan of a room 16 ft. by 22 ft. drawn to a scale of $\frac{1}{4}$ in. to 1 ft.

CIII. INTEREST

Find the interest at 6% on:

1. $420 for 40 d. $300 for 20 d.
2. $300 for 1 m. 10 d. $600 for 45 d.
3. $500 for 6 d. $340 for 3 d.
4. $300 for 9 d. $600 for 1 d.
5. $300 for 7 d. $600 for 8 d.

a. How many acres in a field $12\frac{1}{2}$ rd. by 32 rd.?

b. How many words per minute must a stenographer write in reporting an address of 4400 delivered in 50 minutes?

c. How many strips of carpeting 27 in. wide must be purchased for a room 17 ft. wide?

CIV. REVIEW

1. $2\frac{3}{4} + \frac{5}{6} = x$ $2\frac{3}{4} - \frac{5}{6} = x$
2. $2\frac{3}{4} \div \frac{5}{6} = x$ $\frac{1}{3}$ of $2\frac{1}{2} = x$

3. Find the cost of $4\frac{1}{2}$ tons of coal @ \$$6\frac{3}{4}$ a ton.

4. How many board feet in a half-inch board 8 in. by 12 ft.?

5. Find the cost of 200 spelling-books @ 20¢ less 20%.

6. Of 1 lb. 3 oz. of ham @ 25¢.

7. A house was sold by a real estate agent for $4000 on commission of 5%. How much did the owner realize from the sale?

8. How much is the postage on a package of dry-goods weighing 3 lb. 11 oz.?

a. Allowing nothing for waste, how many feet of inch boards are required to make a solid foot cube?

b. How many to make an 18-inch square? A solid 18-inch cube?

CV. REVIEW

1. How many feet in a joist 3 in. by 4 in., and 12 ft. long?

2. Allowing for no waste, how many feet of boards are required to cover the side of a building 12 ft. 6 in. by 20 ft.?

3. How much would these boards cost @ $30 per M?

4. How many square rods in a rectangular field 40 rd. long and 4 rd. wide? How many acres in it?

5. How many square rods in a field 160 rd. long and 6 rd. wide? How many acres in it?

6. How much is the field worth @ $125 per acre?

7. Ten loads of hay averaging 1200 lb. each were obtained from this field. How much is it worth @ $21 per ton?

8. Find the cost of a chicken weighing 4 lb. 7 oz. @ 25¢.

9. Find the interest on $64.70 for 2 yr. at 5%.

10. Find the cost of 25 arithmetics @ 24¢ less $16\frac{2}{3}$%.

a. At 20¢ a pound, what is the cost of a ham weighing $18\frac{3}{8}$ lb.?

b. Write and solve a problem to find what per cent of the pupils of a school are present.

c. At $30 per M, what will 10 joists, each 2 in. by 8 in. by 12 ft., cost?

Bring to the next lesson a problem suited to your grade which some one has met with in his work or business.

CVI. INTEREST

Find the interest of:

1. $475 for 2 m. @ 6%, $400 for 4 m. @ 6%.
2. $600 for 6 m. @ 6%, $800 for 4 m. @ 3%.
3. $200 for 1 yr. 2 m. @ 6%, $500 for 2 yr. 8 m.
   $675.75 for 1 yr. 8 m. @ 6%, $500 for 2 yr. 1 m.

5. $500 for 2 yr. 8 m. @ 3%, $60 for 10 m. @ 12%.

Interest @ 12% equals how many times the interest @ 6%?

a. How many feet in 6 planks each 2 in. by 8 in. by 12 ft.?

b. How many pecan trees to the acre can be set 3 rd. apart both ways in rows at right angles?

CVII. PER CENT OF GAIN OR LOSS

1. A boat was bought for $800 and sold for $900. How much was gained? The gain was what part of the cost? What per cent?

2. A cap was bought for 75¢ and sold for 90¢. The gain was how much? What part of the cost? What per cent of the cost?

3. A drum was bought for $5 and sold for $4. Was there a gain or loss? How much? What part? What per cent?

4. A horse was bought for $500, and sold for $250. Was there a gain or loss? How much? What part of the cost? What per cent?

What per cent of the cost is gained or lost when something is bought for:

5. 60¢ and sold for 50¢? $150 and sold for $120?

6. $50 and sold for $75? $200 and sold for $275?

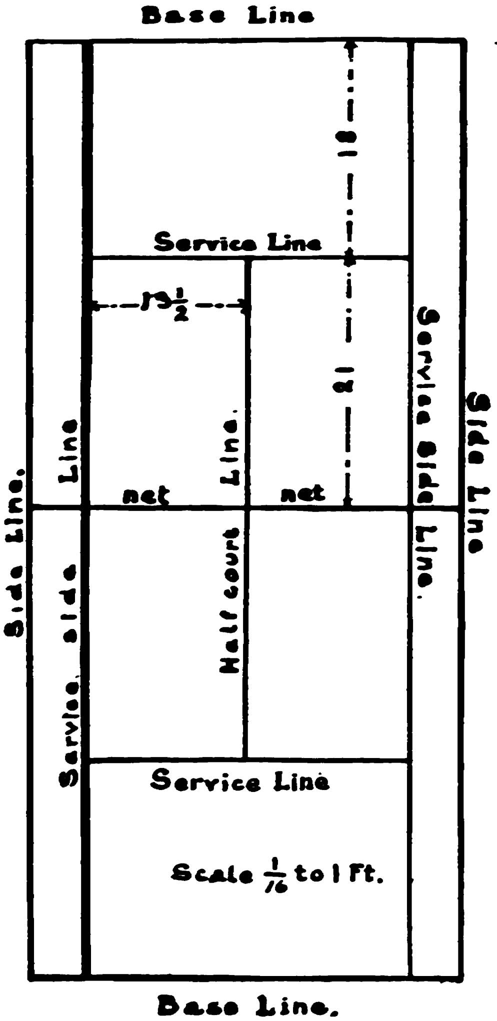
7. $72 and sold for $60? $200 and sold for $325?

Make for the next lesson a problem to find how long boards and how many feet are required to cover a side of a small building.

a. A gain of $38 is a gain of 95%. What is the cost? What is the selling price?

b. By selling @ $75 there was a gain of $25. What was the cost? The per cent of gain?

CVIII. LENGTH — FRACTIONS



By measuring the plan find answers to questions 1–9:

1. How long is the court? The half court?

2. How far are the service lines from the net?

3. How far from the base lines?

4. How long are they?

5. How far are the service side lines from the side lines?

6. What is the sum of the lines which run the entire length of the court?

7. What is the sum of the half-court line and service lines?

8. How many yards of marking tape are needed to mark all the lines running lengthwise of the court?

9. To mark those running across the court?

10. How long is the perimeter of the court?

11. $6\frac{1}{3} \times 2 = x$ $8\frac{3}{4} + 2\frac{1}{6} = x$ $8\frac{3}{4} - 2\frac{1}{6} = x$ $8\frac{1}{2} \div 2\frac{1}{8} = x$

12. How much is the postage on a box of stationery weighing 3 lb. 8 oz.?

a. How many feet in a joist 6 in. by 8 in. by 22 ft.?

b. Write and solve a problem to find the cost of a fish @ 18¢ per pound.

c. How many beets 4 in. apart can be raised in 12 rows each 12 ft. long?

CIX. VALUE — VOLUME — TIME

1. Grading a tennis-court on a sandy lot occupied 2 men and a horse 54 hours. Find the cost of this @ 50¢ an hour.

2. Carting, spreading, and rolling a layer of pebbles took 23 hours. Find the cost of this @ 50¢ an hour.

3. A layer of loam was then spread and rolled down. Find the cost of 30 cu. yd. of loam @ 25¢.

4. Of 3 days' labor of 2 men and 3 horses in carting loam @ $\$6\frac{2}{3}$ per day.

5. Of spreading and rolling loam, 1 man 27 h. @ 20¢.

6. How much was the total cost of grading, pebbles, loam, carting, and rolling?

7. A cubic yard of loam will cover how many square yards with a layer 2 in. deep?

A layer 1 yd. square and 2 in. deep equals what part of a cubic yard?

8. Make and solve a problem to find the cost of a leg of lamb.

a. How many cubic yards would cover an area 30 ft. by 48 ft., 9 in. deep?

b. How many cubic feet will a cart 3 ft. by 6 ft. 4 in. by 1 ft. 4 in. hold?

c. Find the cost of a plank 2 in. by 8 in. by 12 ft., @ 5¢ a foot.

CX. REVIEW

1. If a cup of lard is used with 3 cups of flour in making pie crust, how much flour should be used with $\frac{1}{2}$ cup of lard?

2. $3\frac{1}{7} \div \frac{1}{3} = x$

3. $3\frac{1}{2}$ pk. $= x$ per cent of 1 bu.

4. A lot of land $8\frac{3}{4}$ rd. by $12\frac{1}{2}$ rd. contains how many square rods?

5. A gallon of kerosene will fill how many lamps each holding $\frac{1}{2}$ pint?

6. How much is the postage on a registered package of jewelry weighing 2 oz.?

7. Find the proceeds of 100 boxes of grapefruit sold @ $3.50 on commission of 5%, with freight charges of 50¢ per box?

8. How much will 5 lb. 9 oz. of beef chuck cost @ 14¢?

9. If $5 were given in payment for the beef, what should the seller say in counting out the change?

10. A wheel $3\frac{1}{2}$ ft. high will go how far at each turn?

The circumference of a wheel equals about $3\frac{1}{7}$ times the diameter.

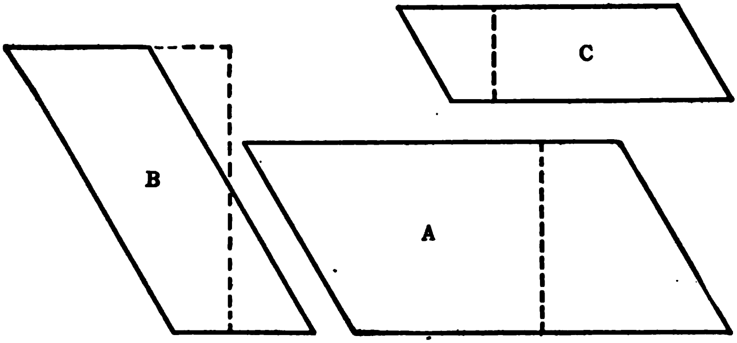
a. A watch which will keep fairly good time for 1 yr. can be bought for $2. For $10 one can be bought which, with an outlay of $1 a year for repairs, will keep good time for 20 yr. Which is cheaper if one needs a watch for 20 yr.? What per cent cheaper?

b. If, with a potato planter, 2 men and a pair of horses @ $6 per day can plant as many potatoes as 20 men @ $1.50 each per day without the planter, how much is the machine worth per day?

c. Find the cost of a ham weighing 18 lb. 6 oz. @ 21¢.

d. In 1903 hemlock boards sold @ $15 per 1000 ft. In 1910 they sold for $22 per 1000 ft. What per cent had the price risen?

CXI. SURFACE — RHOMBOIDS



Scale $\frac{1}{8}$ in. to 1 ft.

1. How is *A* like a rectangle? How does it differ from a rectangle? Both *A* and the rectangle are called **parallelograms**. Why? **Parallelograms having oblique angles**, like the above, **are called rhomboids.**

2. If the rhomboid *A* were cut out, and then cut along the dotted line, could the parts be put together so as to form a rectangle?

3. How does the area of the rhomboid compare with that of the rectangle?

4. How do the length and width of the rhomboid compare with the length and width of the rectangle?

The area of a rhomboid equals the area of a rectangle of the same length and width.

5. How many square feet in *A?* In *B?* In *C?*

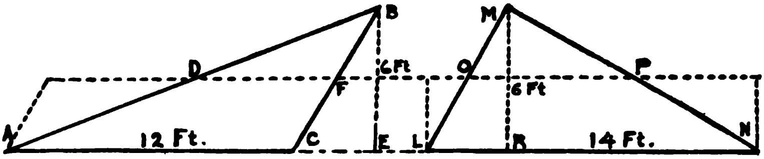
6. How many square rods in a garden in the form of a rhomboid 12 rd. long and $6\frac{3}{4}$ rd. wide?

a. At $30 per M, find the cost of 10 joist each 2 in. by 8 in. and 12 ft. long.

b. How many strips of carpeting 27 in. wide are required for a room 16 ft. wide?

c. Fred owed $10. He paid $1.25, $2.10, $1.60, and $2.05. How much did he then owe?

CXII. SURFACE — TRIANGLES



1. The side of a triangle upon which it is supposed to rest is called its base. What is the base of the triangle *ABC*? Of *LMN*?

2. **The distance from the vertex of the angle opposite the base to the base or base continued, measured at right angles to the base, is called the altitude of the triangle.** What is the altitude of *LMN*? Of *ABC*?

3. Think of the triangle *ABC* cut in the dotted line parallel with the base through the middle point of the altitude, and the vertex *B* carried round to *A*. What form does this make? How does its area compare with that of the triangle? How does its base compare with that of the triangle? How does its altitude compare with that of the triangle?

4. Think of the triangle *LMN* cut in the dotted line parallel with the base through the middle point of the altitude. Think of the triangular cut off as cut again in the line of the altitude, the upper corner of the right part carried round to *N*, and the upper corner of the left part carried to *L*. What form does this make? How does its area compare with that of the triangle? How does its base compare with that of the triangle? How does its altitude compare with that of the triangle?

The area of a triangle equals that of a rectangle of the same base and half the altitude.

5. Find the area of *ABC*. Of *LMN*.

6. Find the area of a triangle whose base is 20 rd. and altitude 10 rd. Of one whose base is 16 yd. and altitude 9 yd.

7. Of one whose base is 15 rd. and altitude 9 rd.

8. Of one whose base is 24 rd. and altitude 5½ yd.

a. Find the cost of 6½ yd. of velvet @ $6.25 per yard.

b. A plan of a house 54 ft. long and 34 ft. wide is drawn to a scale of ¼ in. to 1 ft. How long is the plan? How wide is it?

CXIII. REVIEW

1. How many square rods in a field in the form of a triangle with a base of 20 rd. and an altitude of 12 rd.?

2. A rectangular piece of land ¼ of a mile wide and ½ mile long contains what part of a square mile?

3. How much is the postage on a letter weighing 1½ oz.?

4. How much on a book weighing 1 lb.?

5. Find the cost of 3500 lb. of coal @ $6 per ton.

6. Of 80 grammars @ 72¢ less 16⅔%.

7. How many board feet in a half-inch board 10 in. wide and 12 ft. long?

8. Find the interest on $400 for 9 m. @ 4%. For 1 yr.

9. At $4 per day of 9 h., how much should a carpenter receive for working from 7.30 o'clock until 12?

What part of 9 h. is 4½ h.?

CXIV. INTEREST

Find the interest of:

1. $1000 for 18 d. @ 3%.

First find the interest at 6%, and then at 3%.

2. $50 for 12 d. @ 9%, $400 for 1 yr. 8 m. 6 d. @ 6%.

3. $600 for 6 m. 15 d. @ 6%, $800 for 1 yr. @ 6%.

4. $1200 for 2 yr. 6 m. 6 d. @ 6%, $300 for 1 yr. 6 m. @ 6%.

5. $250 for 2 yr. 3 m. @ 4%.

The interest for 2 yr. 3 m. @ 4% equals what per cent of the principal?

6. $600 for 1 yr. 3 m. @ 4%, $500 for 1 yr. 6 m. @ 5%.

a. Find the interest of $500 for 9 d. @ 9%.

b. Make and solve a problem to find the cost of a piece of meat

CI. REVIEW

1. Find the proceeds from 100 baskets of peas sold @ $1.25 on commission of 5%, with freight charges of 10¢ per basket.

2. How much are the proceeds from the sale of a house lot for $500 on commission of 10%?

3. How much is the postage on a newspaper weighing 3 oz. mailed by you?

4. On a book weighing 3 oz.?

5. On a package of ribbon weighing 3 oz.?

6. On a letter weighing 3 oz.?

7. What is the value of 120 A. of land at $45?

8. On a scale of 40 ft. to 1 in., how long a line should be drawn to represent a length of 120 ft.?

9. Find the cost of 80 geographies @ $1.25 less 20 per cent?

10. $\frac{5}{6} \div \frac{3}{4} = x$ $\frac{5}{6} - \frac{3}{4} = x$ $\frac{5}{6}$ of $\frac{3}{4} = x$

a. How many square feet in a blackboard 4 ft. 8 in. wide and 16 ft. 6 in. long?

b. How many square yards of plastering in the walls of a room 18 ft. by 24 ft., and 9 ft. high?

CII. INTEREST

Find the interest at 6% *on:*

1.	$ 943 for 2 m.	$300 for 10 d.
2.	$1400 for 1 yr. 8 m.	$600 for 22 m.
3.	$ 800 for 18 m.	$600 for 18 m.
4.	$ 320 for 10 m.	$960 for 60 d.
5.	$ 960 for 30 d.	For 20 d.

a. Find the length and width of a plan of a room 16 ft. by 22 ft. drawn to a scale of $\frac{1}{4}$ in. to 1 ft.

CIII. INTEREST

Find the interest at 6% on:

1. \$420 for 40 d. \$300 for 20 d.
2. \$300 for 1 m. 10 d. \$600 for 45 d.
3. \$500 for 6 d. \$340 for 3 d.
4. \$300 for 9 d. \$600 for 1 d.
5. \$300 for 7 d. \$600 for 8 d.

a. How many acres in a field $12\frac{1}{2}$ rd. by 32 rd.?

b. How many words per minute must a stenographer write in reporting an address of 4400 delivered in 50 minutes?

c. How many strips of carpeting 27 in. wide must be purchased for a room 17 ft. wide?

CIV. REVIEW

1. $2\frac{3}{4} + \frac{5}{6} = x$ $2\frac{3}{4} - \frac{5}{6} = x$
2. $2\frac{3}{4} \div \frac{5}{6} = x$ $\frac{1}{3}$ of $2\frac{1}{2} = x$
3. Find the cost of $4\frac{1}{2}$ tons of coal @ $\$6\frac{3}{4}$ a ton.
4. How many board feet in a half-inch board 8 in. by 12 ft.?
5. Find the cost of 200 spelling-books @ 20¢ less 20%.
6. Of 1 lb. 3 oz. of ham @ 25¢.
7. A house was sold by a real estate agent for \$4000 on commission of 5%. How much did the owner realize from the sale?
8. How much is the postage on a package of dry-goods weighing 3 lb. 11 oz.?

a. Allowing nothing for waste, how many feet of inch boards are required to make a solid foot cube?

b. How many to make an 18-inch square? A solid 18-inch cube?

CV. REVIEW

1. How many feet in a joist 3 in. by 4 in., and 12 ft. long?

2. Allowing for no waste, how many feet of boards are required to cover the side of a building 12 ft. 6 in. by 20 ft.?

3. How much would these boards cost @ $30 per M?

4. How many square rods in a rectangular field 40 rd. long and 4 rd. wide? How many acres in it?

5. How many square rods in a field 160 rd. long and 6 rd. wide? How many acres in it?

6. How much is the field worth @ $125 per acre?

7. Ten loads of hay averaging 1200 lb. each were obtained from this field. How much is it worth @ $21 per ton?

8. Find the cost of a chicken weighing 4 lb. 7 oz. @ 25¢.

9. Find the interest on $64.70 for 2 yr. at 5%.

10. Find the cost of 25 arithmetics @ 24¢ less $16\frac{2}{3}$%.

a. At 20¢ a pound, what is the cost of a ham weighing $18\frac{3}{8}$ lb.?

b. Write and solve a problem to find what per cent of the pupils of a school are present.

c. At $30 per M, what will 10 joists, each 2 in. by 8 in. by 12 ft., cost?

Bring to the next lesson a problem suited to your grade which some one has met with in his work or business.

CVI. INTEREST

Find the interest of:

1. $475 for 2 m. @ 6%, $400 for 4 m. @ 6%.

2. $600 for 6 m. @ 6%, $800 for 4 m. @ 3%.

3. $200 for 1 yr. 2 m. @ 6%, $500 for 2 yr. 8 m.

4. $675.75 for 1 yr. 8 m. @ 6%, $500 for 2 yr. 1 m.

5. .$500 for 2 yr. 8 m. @ 3%, $60 for 10 m. @ 12%.

Interest @ 12% equals how many times the interest @ 6%?

a. How many feet in 6 planks each 2 in. by 8 in. by 12 ft.?

b. How many pecan trees to the acre can be set 3 rd. apart both ways in rows at right angles?

CVII. PER CENT OF GAIN OR LOSS

1. A boat was bought for $800 and sold for $900. How much was gained? The gain was what part of the cost? What per cent?

2. A cap was bought for 75¢ and sold for 90¢. The gain was how much? What part of the cost? What per cent of the cost?

3. A drum was bought for $5 and sold for $4. Was there a gain or loss? How much? What part? What per cent?

4. A horse was bought for $500, and sold for $250. Was there a gain or loss? How much? What part of the cost? What per cent?

What per cent of the cost is gained or lost when something is bought for:

5. 60¢ and sold for 50¢? $150 and sold for $120?

6. $50 and sold for $75? $200 and sold for $275?

7. $72 and sold for $60? $200 and sold for $325?

Make for the next lesson a problem to find how long boards and how many feet are required to cover a side of a small building.

a. A gain of $38 is a gain of 95%. What is the cost? What is the selling price?

b. By selling @ $75 there was a gain of $25. What was the cost? The per cent of gain?

CXX. REVIEW

1. If the rows of grapefruit trees in a grove are 30 ft. apart, and the trees are 25 ft. apart in the rows, how many square feet of ground are allowed for each tree?

2. If the rows of corn in a field are 3 ft. 8 in. apart, and the hills are 3 ft. 6 in. apart in the rows, how many square feet of ground are allowed for each hill?

Think the inches in each dimension as a fraction of a foot.

3. $2\frac{1}{3} - 1\frac{3}{10} = x$ $3\frac{4}{5} + 7\frac{1}{4} = x$

4. How much is the postage on a 13-ounce package of newspapers forwarded by a postmaster?

5. On a 13-ounce package of flowers?

6. How much is the cost of 1640 lb. of hay @ $20 per ton?

7. If $20 were given in payment, what should the seller say in counting out the change?

8. Find the cost of a board 13 in. by 10 ft. @ 6¢ per foot.

9. Find the proceeds of 30 doz. eggs sold @ 39¢ on commission of 1¢ per dozen, with express charges of 70¢.

Make a problem such as you know some one has had to do in his work or business.

a. Find the cost of a carpet for a room 14 ft. by $17\frac{1}{2}$ ft., made from carpeting 3 ft. wide @ $1.25 per yard, the strips to run the longer way of the room and to be cut 6 in. longer than the room.

b. Find the circumference of a well 7 ft. in diameter. How long must the inside faces of concrete blocks for the wall of this well be that 11 of them may reach round the well?

c. At $50 per M, find the cost of a plank 2 in. by 9 in. by 16 ft.

d. Find the interest of $600 for 1 yr. 10 m. 1 d. @ 6%.

PART II

Write no Answers in This Book

CXXI. MONEY ORDERS

One may send money to a person at a distance by a bank check, an express money-order, or a post-office money-order. The sender by post-office money-order pays the amount which he wishes to send and a fee, which varies with the amount sent.

The fees for money-orders payable in United States territory, British territory in America, and some other places are as follows:

For money-orders from $ 0.01 to $ 2.50,	3¢,	from $30.01 to $ 40,	15¢
For money-orders from $ 2.51 to $ 5 ,	5¢,	from $40.01 to $ 50,	18¢
For money-orders from $ 5.01 to $10 ,	8¢,	from $50.01 to $ 60,	20¢
For money-orders from $10.01 to $20 ,	10¢,	from $60.01 to $ 75,	25¢
For money-orders from $20.01 to $30 ,	12¢,	from $75.01 to $100,	30¢

1. Find the cost (the amount of the order + the fee) of a money-order for $14 to be sent to Washington, D. C.

2. Of one for $25 payable at Toronto.

3. For $100 payable at Chicago.

4. For $50.25 on Savannah.

5. For $8.75 payable at Kingston, Jamaica.

a. How many orders must be used to send $140 to San Francisco? For what amounts must the orders be drawn to make the fees as small as possible? How much are the fees?

CXXII. REVIEW

1. How much is the premium for insuring a house for \$2000 and furniture for \$800 for 3 yr. @ $\frac{3}{4}\%$?

2. Find the cost of 100 Latin grammars @ \$1.20 less $16\frac{2}{3}\%$.

3. Find the interest of \$2150 from April 4 to Oct. 4 @ 6%.

4. Find the cost of $2\frac{3}{4}$ lb. of swordfish @ 24¢.

5. In a school of 40 pupils 39 were present Monday and 40 Tuesday. What is the average number present for the two days?

6. This number is what per cent of the number belonging?

$1 = x\%$ of 40, $\frac{1}{2} = x\%$ of 40, $39\frac{1}{2} = x\%$ of 40.

7. How many cubic feet of concrete in a piece 1 ft. wide, 6 in. thick, and 16 ft. long?

8. If 50 crates of string-beans are sold @ 90¢ on commission of 5%, with freight charges of 8¢ per crate, how much do they sell for? How much is the commission? The freight charges? How much does the shipper realize?

9. A dozen writing pads weighed 8 lb., and were sold @ 8¢ a pound. How much did they cost apiece?

10. How much is the postage on a box of stationery weighing 11 oz.? How much is it on a book weighing 11 oz.?

a. How many yards of plastering in the walls of a room 15 ft. by 18 ft., and 9 ft. high?

How many yards long are the four walls? How many yards high are they?

b. It takes 100 laths to cover 6 sq. yd. They are sold in bundles of 100 each. How many are required for the walls of the above room?

c. How much will the labor of lathing these walls cost @ 4¢ per square yard?

CXXIII. MULTIPLICATION — DIVISION — THIRTEENS

1. Beginning with 13, write the counts by 13's to 91, and backward to 13.

2. Write the multiplication table of 13's to 7 13's.

3. Write the division table of 13's to 91 = 7 13's.

CXXIV. FRACTIONS OF NUMBERS — DECIMAL SYSTEM

1. Find $\frac{2}{3}$ of 12, 120, 18, 180, 21, 210, 36, 360, 42, 420.
2. Find $\frac{3}{4}$ of 12, 120, 16, 160, 32, 320, 48, 480, 64, 640.
3. Find $\frac{3}{5}$ of 15, 150, 25, 250, 30, 300, 125, $12\frac{1}{2}$, 75, 750.
4. Find $\frac{5}{6}$ of 18, 180, 24, 240, 42, 420, 54, 540, 72, 720.
   a. Find $\frac{3}{8}$ of 24, 240, 32, 320, 40, 400, 56, 560, 72, 720.
   b. Find $\frac{4}{9}$ of 27, 270, 36, 360, 54, 540, 72, 720, 81, 810.

CXXV. REVIEW

1. Find the cost of a board 9 in. by 16 ft. @ 5¢.

2. Find the cost of 2 lb. 5 oz. of ham @ 24¢.

3. How many feet of picture-molding are required for a room 12 ft. by 18 ft.?

4. How many running feet (feet in length) of mopboard are required for this room if it has 3 doors each 4 ft. wide?

5. How many feet in the circumference of a wheel 21 in. in diameter?

6. How many feet will the wheel roll in making 3 complete revolutions?

7. Find the cost of 1400 lb. of hay @ $16 per ton.

8. How many strips of carpeting 27 in. wide are required for a floor 12 ft. wide?

9. Find the cost of 15 histories @ $1.00 less 15%.

Find the cost of 10 and $\frac{1}{2}$ of 10.

a. How wide a strip of sheet iron is needed to make a piece of stove pipe 7 in. in diameter, allowing $1\frac{1}{2}$ in. for the seam?

b. The temperature at 6 A.M. is 58°, at 12 M. 78°, at 6 P.M. 72°, and at 12 midnight 64°. Find the average of these temperatures.

An easy way is to assume some temperature, as 60°, as an average, and find the average of the excess of temperature above the assumed average.

CXXVI. DISTANCES FROM MAPS

Turn to the largest political map of United States in your geography. Measure on the map, and find approximately from the scale of miles the distance in a straight line from:

1. Philadelphia to New York. Chicago to Boston.
2. New York to Chicago. New York to Denver.
3. New York to San Francisco. Chicago to San Francisco.
4. Make a problem suited to your grade to find the cost of a piece of cloth.

a. Find the distance from San Francisco to Honolulu. From Honolulu to Manila.

b. How many rows of spinach 12 in. apart can be planted in a field 6 rd. 1 ft. wide?

c. If these rows are 300 ft. long, and yield 2 bu. for every 100 ft. in length, how many bushels does the piece yield?

CXXVII. FRACTIONS — PER CENTS

1. Change to per cents $\frac{1}{6}$, $\frac{3}{8}$, $\frac{2}{5}$, $\frac{5}{8}$, $\frac{5}{6}$, $\frac{7}{8}$.
2. Change to fractions $66\frac{2}{3}\%$, $62\frac{1}{2}\%$, $16\frac{2}{3}\%$, $87\frac{1}{2}\%$.
3. Change to per cents $\frac{1}{7}$, $\frac{2}{7}$, $\frac{5}{7}$, $\frac{1}{9}$, $\frac{2}{9}$, $\frac{1}{11}$ $\frac{2}{11}$,
4. Change to fractions $11\frac{1}{9}\%$, $44\frac{4}{9}\%$, $14\frac{2}{7}\%$, $9\frac{1}{11}\%$.

CXXVIII. REVIEW

1. A gross equals 12 doz. How many pens in $\frac{2}{3}$ of a gross?

2. Find the cost of 1600 lb. of coal @ $7.

This is how many pounds less than a ton? What part of a ton less?

3. Find the interest of $1500 for 9 d. @ 6%.

4. How much will a tautaug weighing 8 lb. 7 oz. cost @ 7¢.?

5. Find the cost of 14 yd. of cloth @ 98¢.

6. Find the cost of 2 qt. and 1 pt. of milk a day for a week @ 8¢.

7. A wheel $3\frac{1}{2}$ ft. high will go how far with 1 turn?

8. Find the premium for insuring a house for $3500 @ $\frac{1}{3}$%.

9. If this house were destroyed by fire and could be rebuilt for $2500, how much was the loss by the fire? How much should the owner receive from the company?

10. Make a problem to find the cost of feeding 10 hens for the month of May.

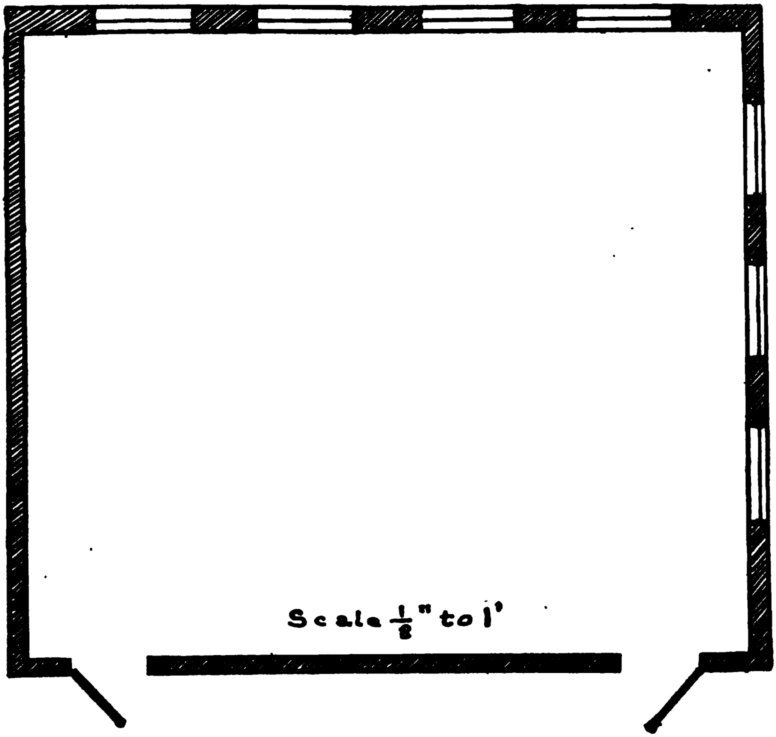
CXXIX. REVIEW — FRACTIONS

1. $2\frac{2}{3}$ yd. + $5\frac{5}{8}$ yd. = x yd. $3\frac{4}{5}$ mi. − $1\frac{2}{3}$ mi. = x mi.
2. $\frac{4}{5}$ mi. ÷ $\frac{2}{3}$ mi. = x $\frac{2}{3}$ of $3\frac{3}{8}$ mi. = x mi.
3. $3\frac{1}{3}$ h. + $7\frac{3}{5}$ h. = x h. $\frac{3}{8}$ of $\frac{1}{2}$ d. = x d.
4. $\frac{2}{5}$ of $15\frac{2}{3}$ m. = x m. $\frac{5}{6}$ ft. ÷ $\frac{2}{3}$ ft. = x
5. $\frac{2}{3}$ h. + $\frac{1}{4}$ h. = x h. $\frac{1}{4}$ h. ÷ $\frac{2}{5}$ h. = x

a. In a room 12 ft. 6 in. by 16 ft., how many running feet (feet in length) of mopboards would be required if there were no doors? How many if there are 2 doors each 4 ft. wide?

b. How many feet of picture-molding are required for this room?

CXXX. LENGTH — REVIEW



1. How long is this schoolroom?

Measure on the plan, and find dimensions from the scale.

2. How wide is it? How wide are the doors?

3. How wide are the windows?

4. What is the total length of picture-molding, which extends round the room?

5. How much will it cost @ 3¢ per foot?

6. Allowing 18 in. for the 2 door frames and casings, how long is the blackboard between the doors in front? It is 4 ft. wide. How many square feet are there in it?

7. How much will it cost @ 25¢ per square foot?

8. How many square feet in the floor? This is how much more than $\frac{3}{4}$ of 1000 square feet?

9. If there were no waste, how much would boards for the floor cost @ $60 per M?

10. Make a problem to find the average number of pupils in school for 3 days.

a. If the above room were 10 ft. high, how many cubic feet of air would it hold?

b. If in ventilating the room it were filled with fresh air every 3 minutes, how many cubic feet of air per minute would be introduced?

c. How many cubic feet of fresh air per minute would this give to each of 40 pupils?

CXXXI. LENGTH — SURFACE — REVIEW

1. In the above room, how much width will be taken up by 6 rows of desks, each 1 ft. 9 in. wide?

2. How much by 5 aisles between them, each 1 ft. 8 in. wide?

3. How much by the rows of desks and aisles together?

4. How much width is left for the 2 side aisles?

5. How much for each side aisle?

6. If there are 7 desks in a row, and a desk and a chair occupy 30 in. of the length of the row, how long are the rows?

7. If the rear chairs are 3 ft. from the wall, how much space is there in front of the desks?

a. Allowing 9 in. for the door frame and casing, find the cost, @ 20¢ a square foot, of a blackboard 4 ft. wide reaching from the rear door to the front of the above schoolroom?

b. Allowing ½ lb. of fertilizer to the square yard, how much is required for a garden 30 ft. by 48 ft.?

CXXXII. REVIEW

1. 20 dimes + 60 nickels = $x

2. Give the dimensions of a board which will make the 2 side pieces of a bookcase 8 in. by 3 ft. and 3 shelves 8 in. by 2 ft.

3. Find the receipts for 30 doz. of eggs sold @ 38¢ on commission of 1¢ per dozen, with express charges of 40¢. Find the proceeds.

4. An order was given for 1½ lb. of steak, and 2¼ lb. were cut. How much more was cut than was ordered? What per cent more?

5. How much does 2¼ lb. cost @ 33¢?

6. What is the interest of $842 for 3 yr. 4 m. @ 3%?

7. How much will 20 Natural Music Readers cost @ 30¢ less 20%?

8. How much is the postage on a registered package of slippers weighing 11 oz.?

9. Find the cost of 6 lb. 3 oz. of beef roast @ 24¢?

10. Find the cost of 2250 lb. of hay @ $18 a ton.

What part of a ton is 250 lb.?

a. A load of wood costing $4.00 lasted a family 6 weeks. What is the average cost per week?

b. In a rubber plantation the rows of trees were 14½ ft. apart, and the trees were 4 ft. 8 in. apart in the rows. A strip of ground 29 ft. wide and 112 ft. long will accommodate how many trees?

CXXXIII. REVIEW

1. How much is the postage on a package of collars weighing 5 oz.?

2. How much on a magazine weighing 5 oz. sent by you?

3. On a package of printed circulars weighing 5 oz.?

4. On 5 oz. of written matter?

5. Find the proceeds of a building lot sold by an agent for $500 on commission of 5%?

6. Find the cost of 10½ yd. of cloth @ $1¼.

7. Find the interest on $1200 for 12 d. @ 6%. For 2 d. For 24 d.

8. If boards supposed to have been sawed 6 in. wide will cover a width of but 4½ in. each after being planed and matched, what part of the original width is left?

a. Such boards as the above are sold as 6-inch boards. How many square feet of surface will 12 ft. of them cover? How many feet of them will it take to cover 12 sq. ft. 30 sq. ft. 600 sq. ft.?

CXXXIV. REVIEW

1. How many square inches in a written page 6 in. by 7½ in.?

2. How much should be received for 18 cans of peas @ 15¢?

3. Find the cost of 20 garden rakes @ 60¢ less 25%.

Measure on map, and find approximately from scale of miles the distance from:

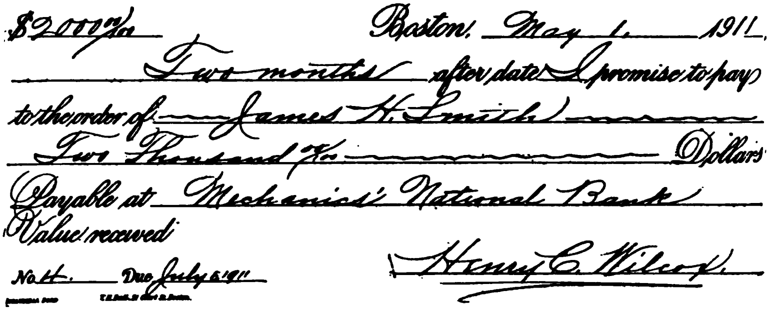
4. New York to St. Louis. New York to Pittsburg.

5. New York to New Orleans. New York to Jacksonville.

6. New Orleans to Colon, Panama.

CXXXV. PROMISSORY NOTES

When one person owes money to another, he often gives a written promise to pay it when demanded, or at a specified time.



$2000 00/100 Boston, May 1, 1911.

Two months after date I promise to pay
to the order of James H. Smith
Two Thousand 00/100 Dollars
Payable at Mechanics' National Bank
Value received

No. 4. Due July 4 1911 Henry C. Wilcox.

This promise is called a **promissory note**, or simply a **note**. Look it through carefully.

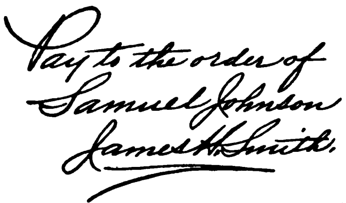
Henry C. Wilcox is called the **maker** of the note.

James H. Smith is called the **payee**.

1. On what condition would Wilcox give this promise?

2. Who is the maker of a note?

3. Who is the payee of a note?



Pay to the order of
Samuel Johnson
James H. Smith.

Indorsement.

Suppose James H. Smith owes Samuel Johnson $400. He may write on the back of it as indicated at the left, and pass it to Johnson in payment of his debt.

In writing his name upon the back of the note, Smith is said to **indorse** it.

The signature is called an **indorsement.**

By indorsing the note Smith **transfers his claim** to

Johnson, and **binds himself to pay** the $400 to Johnson in case Wilcox fails to pay it.

4. Write a note to Henry Wilson for $200, and sign it.

CXXXVI. NOTES — BANK DISCOUNT

The person who has possession of a note and to whom it legally belongs is called the **holder of the note.**

1. Who is supposed to be the holder of the Henry C. Wilcox note?

2. Who is supposed to have been the holder before him?

3. What is meant by indorsing a note?

4. What obligation does this place upon the indorser? If Samuel Johnson wishes to get the money on this note before the two months expire, he may carry it to a national bank or a banking-house and see if the bank will **cash it**, or **discount it.** This the bank will do if the officers are satisfied that the note will be paid promptly when it becomes due. If the bank is willing to cash it, Johnson indorses it by writing his name below the others upon the back, and gives it to the bank.

The bank does not pay the full amount of the note, but **deducts from it the interest at the legal rate for the time remaining before it becomes due**, and pays the balance to Johnson.

The interest deducted is called **bank discount.**

The sum actually paid for the note is called the **proceeds.**

In some states the law allows 3 days (called days of grace) more than the time specified in the note before it is legally due. In these states bank discount is reckoned to the end of the days of grace.

Pupils should follow the practice in their own state. The days of grace make these exercises more complicated, and pupils who must include these might be allowed to compute and write the discount for the time indicated by the note and for the days of grace separately, and after these parts write the total discount or proceeds required.

5. If this note is "discounted" on the day it is dated, how much is the discount?

6. How much are the proceeds? When does the note become due?

7. Who should pay it? To whom?

If the maker fails to pay, the bank looks to the last indorser, from whom it received the note.

a. A painter paints a surface 4 ft. by 6 ft. on the side of a house in 30 min. How long will it take him to paint the whole side of the house, 16 ft. high and 24 ft. long?

b. If all four sides of this house are equal, what will the labor of painting them all cost @ $2.50 per day of 8 hours?

CXXXVII. BANK DISCOUNT

One of the most common use of notes is to borrow money from a bank.

The borrower signs a note to the bank, promising to pay the bank at the end of a specified time a sum sufficient to yield him the amount which he needs.

Each state has fixed a rate of interest as the **legal rate** for all cases in which no other rate has been agreed upon.

At the legal rate find the bank discount and proceeds of a note for:

1. $1200 for 60 d.
2. $500 for 30 d.
3. $600 for 3 m.
4. $900 for 10 d.
5. $300 for 20 d.
6. $600 for 45 d.
7. $657 for 60 d.
8. $480 for 1 m.

a. $600 for 2 m., dated June 5 and discounted June 20.

CXXXVIII. REVIEW

1. Find the proceeds of a note for $500 for 2 m. discounted at date.

2. Find the cost of 5 lb. 11 oz. of corned beef at 14¢.

3. Find the cost of 3 pt. of milk a day for April @ 8¢ a quart?

4. At 8 shingles to the square foot, how many will be required to cover a side of a building 30 ft. long and 20 ft. high?

5. Shingles usually come in bundles of $\frac{1}{4}$ of 1000. Bundles are not broken in selling them. How much will the shingles for the side of the building mentioned cost @ $5.00 per 1000?

6. Find the cost of 20 Second Readers @ 42¢ less $16\frac{2}{3}\%$.

7. Find the interest of $900 for 2 yr. 6 m. @ 6%.

8. Find the cost of 2250 lb. of coal at $7.

9. If the premium for an accident policy for $1000 is $25, it is what per cent of the amount of the policy?

10. At 20¢ a peck, how much should be received for 5 bl. of potatoes containing $2\frac{1}{2}$ bu. each?

a. What will 1 qt. of milk a day for January and February, 1912, cost @ 7¢?

b. A note for $1200 with interest at 5% is dated Jan. 12, 1908, and paid Jan. 12, 1910. How much was due?

c. How many feet in a joist 2 in. by 8 in. by 18 ft.?

CXXXIX. REVIEW

1. Find the proceeds of a note for $250 for 3 m. discounted 1 m. from date.

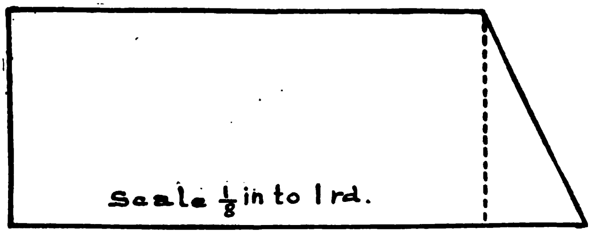
2. Find the cost of a post-office money-order for $75.

3. How much is the postage on a letter weighing $1\frac{1}{2}$ oz.?

4. On a package of merchandise weighing $1\frac{1}{2}$ oz.?

5. On an envelope of printed circulars weighing 1½ oz.?

6. On a newspaper weighing 1½ oz.



7. Find the number of square rods in the field shown in this diagram.

8. How many feet in a board 14 in. by 10 ft.?

9. How much should be received for 3 bu. of potatoes sold @ 35¢ per peck?

10. Find the proceeds of 300 lb. of chickens sold @ 25¢ on a commission of 5% with express charge of $1.50.

a. In a common year how many days are there from Washington's Birthday to April 19? How many weeks are there?

b. If February 22 is Sunday, what day of the week is April 19?

CXL. REVIEW

1. Find the cost of 25 bu. of corn @ 96¢.

2. How much does a half pint of cream cost @ 40¢ per quart? Find the cost of ½ pt. a day for October.

3. If $5 were received in payment for the cream, what should the dealer say in counting out the change?

4. How much is the postage on a registered 10-ounce package of merchandise?

5. On a magazine weighing 10 oz. sent by you?

6. How much are the proceeds on 50 bl. of potatoes sold @ $4 on commission of 5% with freight charges of $1 per barrel?

7. The end of a barrel was 21 in. in diameter. How long a strip of hoop iron was needed to make a hoop for the end of the barrel if the ends of the iron lapped 1 in. for riveting?

8. Find the cost of 65 A. of land @ $12.

9. Of $6\frac{1}{4}$ A. @ $12.50.

10. How many board feet in a plank 2 in. by 8 in. by 6 ft.?

CXLI. TIME BETWEEN TWO DATES

Find the time from Jan. 6, 1907, to Aug. 24, 1910.

a. From Jan. 6, 1907, to Jan. 6, 1910, is how many years?

b. From Jan. 6, 1910, to Aug. 6, 1910, is how many months?

c. From Aug. 6, 1910, to Aug. 24, 1910, is how many days?

d. The whole time from Jan. 6, 1907, to Aug. 24, 1910, is how many years, months, and days?

To find the time between two dates, find:

The number of entire years.

The number of entire months remaining.

The number of days remaining.

Find the time from:

1. Jan. 10, 1909, to June 22, 1910.

2. June 12, 1908, to Sept. 20, 1910.

3. Oct. 9, 1907, to Jan. 16, 1910.

4. April 7, 1908, to June 5, 1910.

5. May 3, 1908, to June 3, 1910.

6. Sept. 12, 1909, to Dec. 5, 1910.

7. April 19, 1775, to Oct. 19, 1781.

8. April 12, 1861, to April 26, 1865.

9. Dec. 18, 1908, to June 7, 1910.

Write a problem to find the cost of a load of coal.

a. A teacher's salary is $600 for a year of 40 wk. How much should she receive for teaching 3 wk. and 1 d.?

b. The temperature at 6 A.M. is 42°, at 12 M. 60°, at 6 P.M. 48°, and at midnight 40°. Find the average of these temperatures.

CXLII. REVIEW

1. Find the time from June 15, 1901, to April 27, 1910.

2. What is the interest of $2000 for 1 yr. 8 m. @ 6%.

3. Find the interest of $800 for 9 d. @ 6%. Of $5000 for 2 m. 6 d.

4. How many shingles laid 6 in. to the weather would cover a square foot?

The average shingle is 4 in. wide, and, as laid in this case, covers a space 4 in. by 6 in.

5. Find the cost of a turkey weighing 16 lb. 12 oz. @ 20¢.

6. How many feet in a house sill 6 in. by 8 in. 36 ft. long?

7. Mr. Smith borrowed $750 January 10, 1910, and paid it with interest @ 6% September 22, 1911. How long did he have the use of this money? How much is the interest on it for this time? How much do the principal and interest amount to?

8. How much will 16½ yd. of cloth cost @ $1.25?

a. How many floor joists 12 ft. long and 12 in. apart "on centers" (from the middle of one to the middle of the next) are required for a floor 12 ft. by 16 ft., if there is one at each end of the floor?

b. If these joists are 2 in. by 8 in., how many feet of lumber in each of them?

CXLIII. NOTES WITH PARTIAL PAYMENTS—REVIEW

$2000 Chicago, June 20, 1909.

On demand I promise to pay to the order of Morse & Smith Two Thousand Dollars ($2000) with interest @ 6 per cent, value received.

Samuel L. Jones.

1. Feb. 20, 1910, $1000 was paid on the above note. How long was that after the note was given? What is the interest on the note to that date?

2. What do the principal and interest then amount to?

3. After the above payment, what remained unpaid?

4. The balance with the interest on it was paid Apr. 20, 1910. How long after the first payment was this? How much was the interest for this time? What was the amount due?

$1000 Philadelphia, Jan. 6, 1910.

On demand I promise to pay to the order of George Allen One Thousand Dollars ($1000) with interest @ 6 per cent, value received.

Andrew F. Slade.

5. March 6, 1910, $800 was paid on the above note. This was how long after the note was given? What did the $1000 and interest amount to at that date?

6. What was the balance unpaid after this payment?

7. The balance, principal and interest, due on the note May 6, 1910, was then paid. This was how long after the first payment? How much was the interest for this time? What was the amount due?

8. Find the cost of 12 arithmetics @ 25¢ less $16\frac{2}{3}$.

a. What is the cost of 1250 lb. of coal @ $8?

b. Find the proceeds of a note for $4000 for 12 d.

CXLIV. REVIEW

1. A note for $600 on demand with interest @ 6% is given Jan. 20, 1910. What does it amount to May 20?

How long is the time to May 20? How much is the interest for this time?

2. A payment of $400 was then made. How much was the balance unpaid? What sum would settle the note July 20, 1910?

3. How much will 4 lb. 2 oz. of fowl cost at 24¢?

4. Find the cost of 50 New Century Histories of the United States @ $1.00 less 20%.

5. Find the cost of a post-office money-order for $22.45.

6. $\frac{3}{4}$ of $\frac{1}{2}$ = x%   ($\frac{3}{5}$ of $\frac{2}{3}$) + ($\frac{2}{3}$ of $\frac{3}{4}$) = x

7. $\frac{1}{5}$ gal. = x% of 1 qt.   250 lb. = x% of 1 T.

8. How many square feet in a triangle whose base is $12\frac{1}{2}$ ft. and whose altitude is 8 ft.?

Write a problem which arose in the experience of some one.

a. If sawing and splitting wood for a stove costs $2 per cord, and $\frac{3}{4}$ cd. of wood before it is prepared will measure a cord after it is prepared, which is the cheaper, the wood not prepared at $8 per cord, or the prepared at $10?

b. What per cent cheaper?

CXLV. REVIEW

1. A house lot 50 ft. wide contained 5000 sq. ft. How long was it? How many feet of fence will inclose it?

2. Find the bank discount on a note for $200 for 2 m.

3. How much is the postage on a registered package of medicine weighing 13 oz.?

4. On a package of printed circulars weighing 13 oz.?

5. On a magazine weighing 13 oz. sent by you?

6. On a registered package of written matter weighing 13 oz.?

7. Find the approximate weight of air which a box 2 ft. 6 in. by 3 ft. by 2 ft. will contain.

$4000 New York, Aug. 12, 1910.

On demand I promise to pay to the order of Rufus M. Smith Four Thousand Dollars with interest at 6%, value received.

Marshall A. Sanderson.

8. Payments on the above note were made as shown by the indorsements at the right.

How much was the amount at the time of the first payment?

Received on within note
$1600 Oct. 12. 1910
$1400 Feb. 12. 1911

How much was the balance after the first payment?

9. How much was the interest from the first payment to the second? What was the balance after the second payment?

10. How much is the interest on the balance to April 12, 1911? What sum would settle the note April 12, 1911?

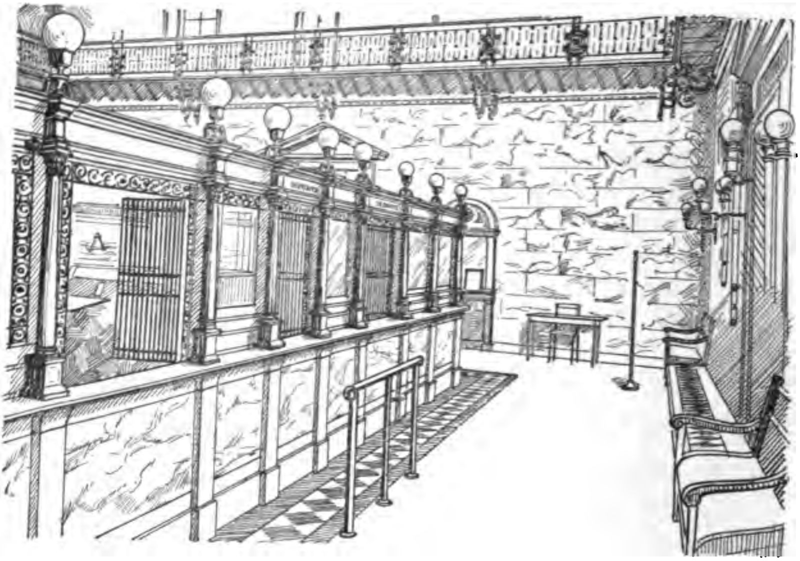
11. How much will 5 lb. 2 oz. of chicken cost @ 28¢?

12. If $5 were given in payment for the chicken, what should the seller say in counting out the change?

a. In making ice cream Sam used 15 lb. of ice, 10¢, $1\frac{1}{2}$ lb. of salt @ 2¢, $1\frac{1}{2}$ pt. of cream @ 15¢ per half pint, $1\frac{1}{2}$ pt. of milk @ 8¢ per quart, $1\frac{1}{2}$ lb. of sugar @ 6¢, and the juice from 1 box of raspberries @ 14¢. What was the cost of the material?

b. He made 3 qt. of ice cream. What did it cost per quart? What would his cream sell for at 10¢ per plate if a quart makes 6 plates?

CXLVI. SAVINGS BANK INTEREST



Savings-banks differ in the times at which interest on deposits begins and the times at which interest is added to the principal.

Where necessary, the following problems should be modified to conform to the practice of the banks.

Unless otherwise stated, in all savings-bank problems in this book interest on new deposits is to begin Jan. 1, Apr. 1, July 1, and Oct. 1.; and interest is computed and added to the principal April 1 and Oct. 1. The rate is 4% per year. When money is withdrawn from the bank, no interest on the amount withdrawn is allowed for the time since the last dividend.

1. Mary deposits $300 Jan. 30. When will interest begin?

2. When will the first dividend (interest) be computed and added to the principal? For what time?

3. What will this dividend amount to?

4. How much has Mary then in the bank?

5. For what period is interest next reckoned?

6. How much is this dividend?

7. How much has Mary in the bank?

8. Mr. Donald deposits $1000 in this bank Sept. 30. When does interest begin? When and for what time is the first dividend computed?

9. How much is this dividend? How much has Mr. Donald then in the bank?

10. When and for what time is the next dividend made? How much is it? How much has Mr. Donald then in the bank?

a. Ned deposits $200 in the above bank Apr. 29. When does interest on this begin? When is his first dividend added? How much is it?

b. How much has he then in the bank? How much is the next dividend? How much has he then in the bank?

CXLVII. REVIEW

1. March 10 A deposits $800 in a savings-bank. When does interest begin? When is the first dividend computed? How much is the dividend?

2. What is the new principal? When is the next dividend computed?

3. How much is it? What is the new principal?

4. How many square yards in the walls of a room 15 ft. by 21 ft. by 9 ft.?

Think the dimensions in yards.

5. How many gallons of ice cream will be sufficient for 60 people, allowing 1 qt. for 5 persons?

6. If a horse eats 8 qt. of oats a day, how long will a measured bushel last him?

7. How many strips of carpeting 27 in. wide will be required for a floor 24 ft. wide?

8. How much is the postage on a special delivery letter weighing a little over 2 oz.?

9. A cup holds $\frac{1}{2}$ pt. How many cupfuls in 2 gal.?

10. What is 10% of 25%, of $33\frac{1}{3}$% of $2400?

Write a problem to find the proceeds from eggs sold on commission.

a. A cedar gate-post is 6 in. by 10 in. at one end, 4 in. by 10 in. at the other, and 10 ft. long. How many board feet in it?

What is the average thickness of the post?

b. Find the approximate weight of air in a room 10 ft. by 12 ft. by 8 ft.

Instead of finding the weight in ounces and changing to pounds, we may take out of the above dimensions the factors of 16, and the product of the remaining factors will equal the number of pounds.

c. Find the cost of 2 lb. 14 oz. steak @ 28¢.

CXLVIII. REVIEW

1. How much is the premium for insuring a garage for $800 for 2 yr. @ $\frac{3}{5}$%?

2. Find the cost of 3 globes @ $10.00 less 40%.

3. What would they cost if there were two discounts, the first of 30% and the second of 10%?

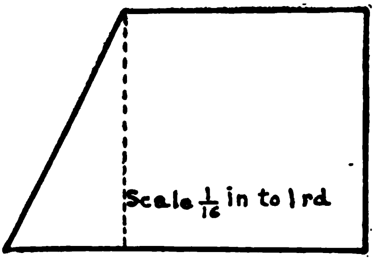
4. A note for $900 for 3 m. is discounted at a bank 1 m. from date. What are the proceeds?

5. Find the cost of 6 lb. 2 oz. of lamb @ 20¢.

6. How much are the proceeds from the sale of a house and land for $10,000 on commission of 5%?

7. How many square yards of plastering in the ceiling of a room $16\frac{1}{2}$ ft. by 18 ft.?

8. On a note for $600 with interest on demand dated Jan. 1, 1911, a payment of $400 is made Sept. 1, 1911. What is the balance due after this payment?



9. How much is due Nov. 1, 1911?

10. How many square rods in the field shown in this plan? How many acres?

a. A deposit of $800 is made in a savings-bank April 25. When will it begin to bear interest? When will the first dividend be made? How much is it? What is the amount of the deposit then?

b. Find the cost of a house lot 48 ft. 6 in. by 100 ft. @ 10¢ per foot.

c. Find the weight of the air in a room 20 ft. by 12 ft. 6 in. by 8 ft. Work this in the easiest way.

CXLIX. TAXES

1. A town with taxable property valued at $2,000,000, raises $20,000 by taxation. How many thousand dollars of taxable property in the town?

2. What part of the whole tax must be raised on 1 thousand dollars of the property?

3. How much must be raised on 1 thousand dollars of property?

Make the division easy by leaving off the same number of zeros in both divisor and dividend.

4. How much must be raised on 2 thousand dollars of property? How much on $2500?

5. How much on $4500?

Land and buildings are real estate. Other property is personal property.

6. A man's house and land in this town is valued at $3500, and his taxable personal property at $1500. How much is the tax on his property?

7. Another person's taxable property in the town was valued at $1250. How much is his tax?

8. Another town has taxable property valued at $3,000,000 on which to raise a tax of $45,000. How many thousand dollars of taxable property in the town? What part of the whole tax must be raised on $1000 of property?

9. How much must be raised on each thousand?

To find how much must be raised on each thousand dollars of property, divide the whole tax by the number of thousand dollars of taxable property in the town.

10. How much is the tax on $2500 in this town?

CL. REVIEW

1. Find the tax rate per $1000 in a town having a tax of $48,000 to raise on a valuation of $4,000,000.

2. How much is the tax in this town on real estate valued at $2000 and personal property valued at $1500?

3. Find the amount of A's tax in this town, including the tax on property valued at $2100 and a poll-tax of $2.

4. How much should be received for 40 bu. of potatoes sold at 40¢ per peck?

5. For 2 qt. 1 pt. of milk per day for June at 8¢ per quart?

6. How many square feet in a floor 12½ ft. by 16 ft.?

7. How many square rods in a triangular field whose base is 60 rd. and whose altitude is 40 rd.?

8. How much is the postage on a package of merchandise weighing 1 lb. 5 oz.?

9. On 6 T. of newspapers sent by the publisher?

10. Find the proceeds of a note for $600 for 3 m. discounted at a bank at date.

CLI. REVIEW

1. Find the cost of a post-office money order for $42.

2. Find the proceeds of a note for $100 for 1 m. discounted at a bank.

3. How many feet in a board 8 in. by 12 ft.?

4. Find the cost of 50 hoes @ 40¢ less 25%.

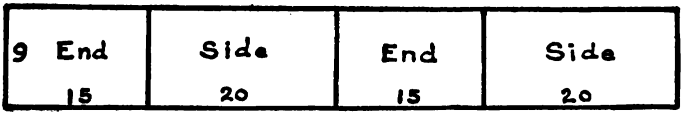
5. How many square inches in a page 4½ in. by 6½ in.?

a. A strip of land a mile (320 rd.) long and a rod wide contains how many acres? A strip 160 rd. by 20 rd.?

b. Electric cars on a certain line are 30 min. apart and make the round trip in 2½ h. How many cars are running at one time?

CLII. SURFACE — PLASTERING

1. In thinking the area of the walls of a room, it is convenient to think the four walls as one long rectangle whose length equals the perimeter of the room and whose width is the height of the room. What is the total length of the walls shown in the following diagram? How many square yards in them?



2. How much would it cost to lath and plaster the walls of this room @ 40¢ per square yard?

3. How long and wide is the rectangle which equals the walls of a room 12 ft. by 18 ft., and 9 ft. high?

4. How many square yards in it?

5. How much would the labor of lathing these walls cost @ 4¢ per square yard?

6. How much would the labor of plastering these walls cost @ 6¢ per square yard?

7. What are the dimensions of a rectangle which equals the walls of a room 15 ft. by 18 ft., and 9 ft. high? How many square yards in the walls and ceiling?

8. Find the cost @ 8¢ per square yard of mortar for plastering this room.

9. Laths are commonly sold in bundles of 100 each, and 100 will cover 6 sq. yd. How many bundles are required for the above room?

10. How much will they cost @ 30¢ per bundle?

a. Find the number of square yards in the walls and ceiling of a room 15 ft. by 21 ft. by 9 ft. The cost of laths for the room @ 30¢ per 100. Of the labor of lathing @ 4¢ per square yard. Of the mortar @ 8¢ per square yard. Of the labor of plastering @ 7¢. The total cost.

b. How wide is an acre lot 40 rd. long? At $3 an acre, how much will the plowing of a field 40 rd. by 60 rd. cost?

CLIII. SURFACE — TINTING — PAINTING

1. How many square yards in the walls of a room 18 ft. square and 9 ft. high.

2. How many square yards in the ceiling of this room? How many square yards in both walls and ceiling?

3. How much will it cost to tint the walls and ceiling of this room with japalac @ 8¢ per square yard?

4. Find the cost of calcimining the walls of the room in 3 @ 5½¢ a square yard.

5. A kitchen is 12 ft. by 13½ ft., and the walls are sheathed with yellow pine to a height of 3 ft. from the floor. How many square yards of sheathing are there? How many square yards in the floor?

6. How much will it cost to give this sheathing and floor two coats of shellac @ 15¢ per square yard?

7. This kitchen is 9 ft. high. How many square yards in the part of the walls above the sheathing?

8. How many square yards in the ceiling? How many in the ceiling and the walls above the sheathing?

9. How much would it cost to lath and plaster this surface @ $33\frac{1}{3}$¢ per square yard?

10. How much would it cost to paint this plastering two coats @ 15¢ per square yard?

a. How many square yards in the ceiling and walls of a room $16\frac{1}{2}$ ft. by 18 ft. by 9 ft.?

b. Find the cost of 12 adjustable school desks and chairs @ $3.45. $(12 = 10 + 2)$

CLIV. REVIEW

1. Find the interest of $200 for 2 yr. 1 m. @ 6%.

2. Find the weight of the air in a room 10 ft. by 16 ft. by 8 ft., supposing 1 cu. ft. to weigh 1 oz.

3. Find the proceeds of a note for $350 for 2 m. discounted at a bank at date.

4. A note for $600 with interest @ 6% was given Aug. 1, 1910, and $500 was paid Oct. 1, 1910. How much remained unpaid?

5. Find the premium for insuring a house for $3000 @ $\frac{2}{3}$%.

6. How many strips of carpeting 27 in. wide must be bought to cover a floor 15 ft. wide?

7. Find the cost of 3 lb. 14 oz. of beef @ 15¢.

8. December 28 $50 was deposited in a savings bank. When does it begin to bear interest? When is the first dividend added? How much is the dividend? How much has the depositor then in the bank?

9. A's tax is $12. If he is allowed a discount of 2% for prompt payment, how much must he pay?

a. Find the cost of a ham weighing 24 lb. @ 21¢.

b. A sloyd class make towel rollers $1\frac{3}{8}$ in. in diameter and 16 in. long. How many rollers can be cut from a $1\frac{1}{2}$-inch plank 10 in. wide and 10 ft. long if they are marked out on the plank $1\frac{3}{4}$ in. wide?

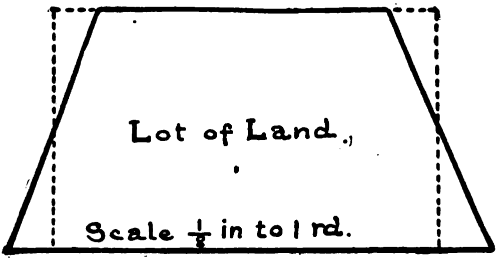
CLV. REVIEW

1. Write in decimal form in position to add $\frac{3}{5}$, 75%, $\frac{1}{8}$, $48\frac{3}{10}$, and $9\frac{7}{8}$.

2. $2\frac{1}{2}$ mi. + $6\frac{7}{8}$ mi. + 40 rd. = x mi.

3. $\frac{5}{9}$ of $2\frac{1}{4} = x$.

4. $4\frac{1}{2} \div \frac{1}{3} = x$



5. How long are the parallel sides of the lot represented by the diagram? What is the average length of the lot?

What is the surface of this form called?

6. How wide is the lot? It contains how many acres?

7. Two men work from 8.15 to 11 A.M. repairing a furnace @ 40¢ each per hour. How much does the labor cost?

8. How much is the postage on a letter weighing 4 oz.? On a book weighing 4 oz.?

9. Find the proceeds of 200 baskets of peaches sold at $1.00 on a commission of 5%, with freight charges of 15¢ per basket?

a. Find the circumference of a wheel 7 ft. 7 in. in diameter.

CLVI. SURFACE — WALL-PAPERING

The more common wall papers are sold in rolls, each containing a strip 18 in. wide and 24 ft. long, and in double rolls containing strips twice as long.

Some wall papers of the better grades are made more than 18 in. wide; but in that case the rolls are shorter. A roll always contains 4 square yards of paper.

In exercises in this book consider strips of wall paper 18 in. wide unless some other width is specified.

1. How many strips of wall-paper are required for a space 6 ft. wide? For one 7 ft. wide? 8 ft. wide?

2. How many for a wall 10 ft. wide? 12 ft. wide?

3. For a wall 14 ft. wide? 18 ft. wide? 28 ft. wide?

4. How much width of wall-paper would be required for a room 12 ft. by 16 ft. if there were no windows or doors? How many strips?

In estimating the quantity of paper required for a room in the following exercises, deduct from the whole width around the room (the perimeter) half the width of the doors and windows.

To estimate closely, one must examine the pattern of the paper carefully, to see how great the waste will be, and notice the heights of the windows and doors as compared with the height of the room.

5. If there are 3 doors and 4 windows in the above room each 4 ft. wide (including frame and casing), how much should be deducted from the total width of paper required? How much remains?

6. How many strips of paper are required?

7. If the above room is 8 ft. high, the base-board 9 in. high, and the design on the paper such that there is a waste of not more than 6 in. on each strip in matching figures, how many strips will a roll make? How many rolls are required?

8. A room is 14 ft. by 16 ft., with 4 doors and 4 windows averaging 4 ft. wide. How great is the perimeter of the room? How much should be deducted from this for doors and windows? How much width of paper must be furnished? How many strips are required?

9. If the room is 7 ft. high from the top of the base-board to the lower edge of the border, and there is a waste of only 3 in. to a strip in matching figures, how many strips will a roll make? How many rolls will be required?

In making the estimate for wall-paper, find:

The total width required.
The number of strips.
The length of strips.
The number of strips in a roll or double roll.
The number of rolls.

CLVII. REVIEW

1. How many strips of wall-paper are required for a room $13\frac{1}{2}$ ft. by 15 ft., with 3 doors and 3 windows averaging 4 ft. wide?

2. The walls are 9 ft. high with a base-board 9 in. high and a border at the top 10 in. wide. How long must the strips be?

3. There is a waste of 18 in. to the roll in matching strips. How many strips will a roll make? How many rolls are required?

4. Find the cost of 3 lb. 12 oz. of ham @ 25¢.

5. Of 14 rolls of wall-paper @ 19¢.

6. Of 3500 lb. of coal @ $6.

7. Of insuring a building for $1700 @ $\frac{3}{4}$%.

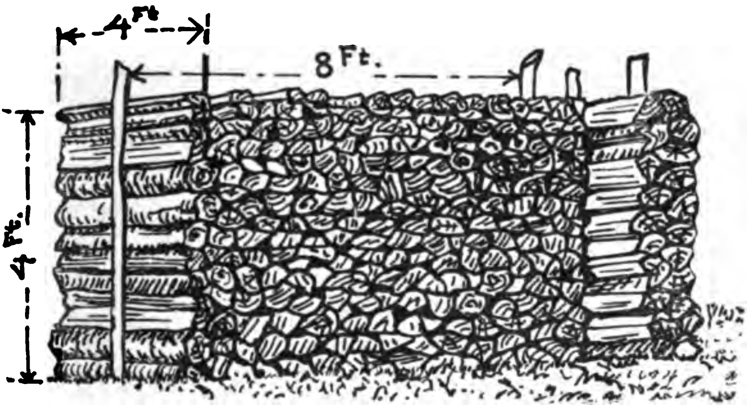
8. Of 90 Third Readers @ 50¢ less $16\frac{2}{3}$%.

a. Manila paper in 4-pound packages of 1000 sheets each sold @ $50 per ton. How much per pound was this? How many sheets in a pound? How many sheets did a cent pay for?

b. How many square yards in a rug $7\frac{1}{2}$ ft. by 11 ft.?

c. Find the proceeds of a note for $600 for 20 d.

CLVIII. WOOD MEASURE



Cord-wood is cut 4 ft. long.

A pile 4 ft. wide, 4 ft. high, and 8 ft. long is a cord.

A pile 4 ft. by 4 ft. by 1 ft. is a cord foot.

1. How many cord feet in a cord?

How many cords in a pile of wood:

2. 4 ft. by 4 ft. by 16 ft.? 4 ft. by 4 ft. by 4 ft.?
3. 4 ft. by 4 ft. by 20 ft.?

A pile 4 ft. by 4 ft. by 8 ft. = 1 cd. A pile 4 ft. by 4 ft. by 20 ft. = x cd.

4. 4 ft. by 8 ft. by 20 ft.? 4 ft. by 4 ft. by 24 ft.?
5. 4 ft. by 8 ft. by 24 ft.? 4 ft. by 6 ft. by 8 ft.?
6. 4 ft. by 6 ft. by 24 ft.? 4 ft. by 5 ft. by 24 ft.?
7. 4 ft. by 6 ft. by 16 ft.?

A pile 4 ft. by 4 ft. by 16 ft. = x cd. A pile 4 ft. by 6 ft. by 16 ft. = x cd.

a. 4 ft. by 7 ft. by 16 ft.? 4 ft. by 4 ft. by 30 ft.?

b. 4 ft. by 6 ft. by 30 ft.? 4 ft. by $4\frac{1}{2}$ ft. by 16 ft.?

c. A roll of wall paper 3 ft. wide is how long?

CLIX. REVIEW

1. How many cords in a pile of wood 4 ft. by 4 ft. by 29 ft.?

2. Find the interest of $400 for 2 yr. 1 m. @ 6%.

3. Find the cost of 250 lb. of coal @ $7 per ton.

4. Find the cost of 2 lb. 12 oz. of steak @ 33¢.

5. Of 60 Second Readers @ 40¢ less 20%.

6. How many yards of plastering are required for the walls of a room 15 ft. by 21 ft., and 9 ft. high?

7. How much will the labor of plastering these walls cost @ 8¢ per square yard?

8. How many strips of wall paper 3 ft. wide would be required for these walls if there were 5 windows and 4 doors averaging 4 ft. wide?

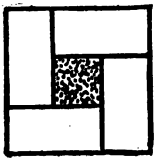
9. How much should be received for 12 pairs of shoes @ $1.98?

10. How much postage is required for a magazine weighing 9 oz. sent by you?

11. How much would be required if it were sent by a news-agent?

12. How much is required for 9 oz. of written matter?

a. How many layers of bricks 2 in. thick, with $\frac{1}{4}$ in. of mortar between the layers, are required to build a column 3 ft. high?



b. The number of bricks in a layer and their arrangement are shown in the plan. How many bricks are required for the column?

c. Find the cost of 60 yd. of gingham @ 12½¢.

d. The elevation of Venus above the horizon at a certain time was $\frac{1}{8}$ of the distance from the horizon to the zenith. How many degrees was Venus from the horizon?

CLX. REVIEW

1. Find the proceeds of a note for $150 for 10 d. discounted at a bank.

2. A note for $250 with interest @ 6% is dated Jan. 10, 1911. A payment of $200 on this note was made May 10. How much remained unpaid?

3. Henry deposited $20 in a savings bank March 20. When does it begin to bear interest? When is the first dividend added? How much has he then in the bank?

4. Find the proceeds from the sale of a grapefruit grove by an agent for $3500 on a commission of 10%.

5. To make 16 cups of cocoa, use ⅜ can of cocoa @ 20¢, 2 qt. milk @ 8¢, 2 qt. water, and 1 lb. sugar, 6½¢. Find the value of the ingredients.

6. How much is the cost per cup?

7. How many times this cost is 5¢ per cup?

8. A town raises a tax of $50,000 on property valued @ $4,000,000. This tax is to be raised on how many thousands? What part of it must be raised on $1000?

9. How much must be raised on $1000? How much on property valued at $1500?

10. How much is the postage on an 8-ounce package of seeds?

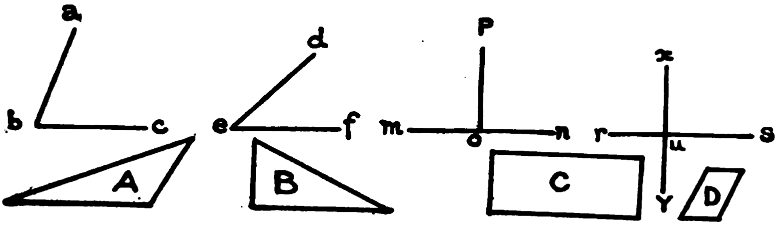
a. Find the cost of 22½ yd. of carpeting @ $1.25.

b. How many strips of wall paper are required for a room 16½ ft. by 24 ft., with 5 windows and 3 doors averaging 4 ft. wide, and an opening 8 ft. wide to an adjoining room?

Deduct the whole width of all openings, as the pieces left after cutting off the long strips will fill the spaces above and below the openings.

c. This room is 9 ft. high, with base-board 9 in. high. How many strips will a roll make? How many rolls are required?

CLXI. ANGLES



1. Do the lines *ba* and *bc* above extend in the same direction, or in different directions from the same point?

The difference in direction of two lines extending from a point is an angle.

The lines which form the angle are its **sides.**

The point from which they extend is its **vertex.**

2. How many angles are shown above?
3. Which have the greater difference in direction, those extending from *e*, or those extending from *b*?
4. Which of these is the greater angle?
5. Name 2 angles having their vertices at the same point and one side in common.
6. Compare the angles *pom* and *pon* in size.

Angles of the size of these formed on the same side of a straight line so as to make the adjacent angles equal are **right angles.**

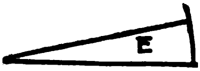
7. How many other right angles are shown above?
8. How many right angles in the same plane can have their vertices at the same point?
9. Compare the angles of *D* with right angles in size.
10. What other angles smaller than right angles are shown?

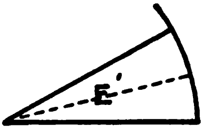
Such angles are **acute** (sharp) **angles.**

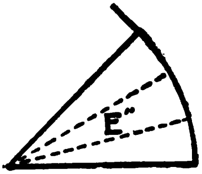
11. What angles larger than right angles are shown?

Such angles are **obtuse** (blunt) **angles.**

CLXII. ANGLES — MEASURE







1. Compare the angles E, E', and E'' in size.

A part of the circumference of a circle is **an arc.**

2. Where are the centers of the arcs which join the sides of these angles?

3. Compare the arcs for the angles E, E', and E''.

4. How does the increase of the arcs compare with the increase of the angles?

An angle is measured by the number of degrees in the arc joining its sides and centering at the vertex.

5. How many degrees in half of a circumference?

6. How many of these degrees in one right angle?

7. What do you know of the number of degrees in an acute angle? Of the number in an obtuse angle?

8. How many degrees in $\frac{1}{2}$ of a right angle? In $\frac{1}{3}$ of a right angle? In $\frac{2}{3}$ of a right angle? In $\frac{1}{6}$?

9. Over how many degrees does the minute hand of a clock pass in 15 min.? In 5 min.?

10. Over how many degrees does the hour hand pass in 6 hours? In 3 hours? In 9 hours? In 2 hours? In 1 hour?

a. The angle at *E* is about what part of a right angle?

b. The largest angle in *A* equals how many right angles?

c. Through how many degrees does the second hand of a watch move in 10 seconds. In 25 seconds?

CLXIII. LONGITUDE — TIME

1. Through how many degrees does a point on the earth's surface move in the earth's rotation for 24 h.?

2. Through how many degrees does it move in 2 h.? In 1 h.?

3. What part of an hour, or how many minutes, does it take to move through 1°?

4. If one of two places is 15° farther east than the other, how much difference in their times of sunrise is there?

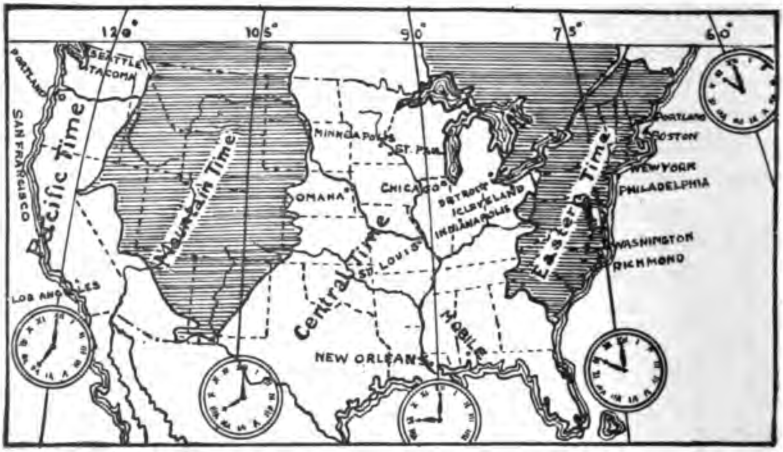
5. Which will have its sunrise earlier? How much?

6. When it is 12 o'clock, sun time, at a certain point, what is the sun time 15° farther east? 1° farther east?

7. What is it 5° farther west? 60° farther west?

If a point is 15° east of another, its sun time is 1 h. faster.

If it is 1° farther east, its sun time is 4 min. faster.



The standard time system in the United States adopts the time of the 75th meridian for a belt extending with irregular boundaries on each side of that meridian, the time of the 90th meridian for a similar belt on each side of that meridian, the time of the 105th meridian for a belt on each side of that meridian, and the time of the 120th meridian for a belt on each side of that.

As shown by the map, the boundaries of these time belts are determined largely by the lines of travel and transportation.

8. How many degrees apart are these meridians? What is the difference in time in two adjacent belts?

9. A place on the 70th meridian has the time of what meridian?

What is its sun time when it is noon by the standard time?

10. New York City is 74° west longitude? When it is 6 A.M. by its standard time, what is its sun time?

CLXIV. LONGITUDE AND TIME

Use the best maps in your geography to aid you in answering the following questions.

Is the sun time faster, or slower than the standard time, and approximately how much:

1. In Washington, D. C.? In Pittsburg?
2. In Charleston? In Savannah?
3. In Cleveland? In Chicago?
4. In New Orleans? In Galveston?
5. In Denver? In Salt Lake City?
6. In Seattle? In San Francisco?
7. When it is 9 A.M. at New York, what time is it at Detroit? At St. Louis? At Memphis? At Minneapolis?
8. At Omaha? At Portland, Oreg.? At Los Angeles?

a. Find the area of a gravel walk 8 ft. wide just inside the fence surrounding a rectangular field 300 ft. long and 216 ft. wide.

b. How much money must be put at interest at 5% to yield an annual income of $650?

How much will $1000 yield?

CLXV. LONGITUDE — TIME

1. On ocean steamers going east or west the clocks are set every day to agree with the time of the longitude which they have reached.

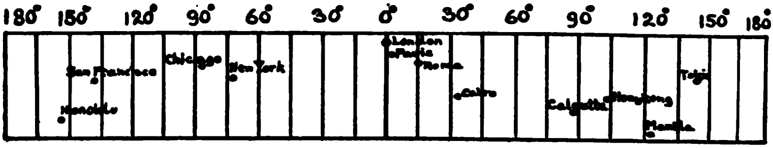
On steamers going east, are they set forward, or backward?

On steamers going west?

Greenwich is on the meridian from which longitude is measured. Its longitude is 0°.

New York, 74° west
Chicago, $87\frac{1}{2}$° west
San Francisco, $121\frac{1}{2}$° west
Paris, 2°; east

Rome, $12\frac{1}{2}$° east
Manila, 121° east
Tokyo, 140° east



In the following questions take the standard time for places in the United States and the sun time for other places:

2. When it is 12 M. in New York, what time is it in Chicago?

3. In San Francisco?
4. In Greenwich?
5. In Paris?
6. In Rome?
7. In Manila?
8. In Tokyo?

9. It is 6 A.M. at Philadelphia. What time is it at Omaha?

a. $3\frac{1}{4} \times 47$ lb. $= x$ $\qquad 9{,}600{,}000 \div 2000 = x$

b. A ton of coal occupies about 35 cu. ft. of space. Give dimensions of a bin which will hold 4 T.

c. How many acres in a strip of land $\frac{1}{2}$ mi. long and 4 rd. wide? In a tract a half mile square?

d. In a tract $\frac{1}{4}$ of a mile square?

CLXVI. REVIEW

1. How much are 100 lb. of rubber worth @ $1.12½ per pound?

2. What will $644 amount to at 4% when it has been at interest 3 m. in a savings bank and the interest has been added?

3. Find the cost of a chicken weighing 5 lb. 9 oz. @ 25¢?

4. If a roll of paper will make 3 strips, how many rolls are required for the walls of a room 12 ft. by 16 ft. with 4 windows and 3 doors averaging 4 ft. wide?

5. A field a half mile long and 40 rd. wide contains how many acres?

6. A pile of wood 4 ft. wide, 6 ft. high, and 36 ft. long contains how many cords?

7. How many square yards in a rug 7½ ft. by 12 ft.?

8. When it is 12 M. in Chicago, what time is it in Rome (12½° E.)?

9. In a town with a valuation of $5,000,000 a tax of $80,000 is to be raised upon the property. How much must be raised on $1000?

10. What is the tax on a house assessed for $3500?

a. When it is 12 o'clock in Paris (2° E.), what time is it in London (10 min. W.)?

b. How many tons in 2500 bales of cotton averaging 500 lb. to the bale?

c. A man insures his life for $2000 at the rate of $38.80 a year per $1000. What is the annual premium?

d. What is the value of a pile of wood 4 ft. by 48 ft. by 8 ft. @ $6 per cord?

e. A house is bought for $3500, and furnished for $1000. It is rented for $550 a year. But there is an average expense of $50 a year for repairs and $50 for taxes. The net income from the house per year is what per cent of its cost?

CLXVII. REVIEW

1. When it is 12 M. in Paris, what time is it in New York?

2. Find the cost of 32 geographies @ 50¢ less $16\frac{2}{3}\%$.

3. How many board feet in a plank 2 in. by 6 in. by 10 ft.?

4. Find the proceeds of a note for $600 for 1 m. discounted at a bank.

5. A woman works from 8 A.M. to 5 P.M. @ 20¢ an hour. How much does she earn?

6. Find the proceeds of 200 bl. of apples sold @ $2.50 on commission of 5%, with freight expense of 25¢ per barrel.

7. A plank 12 ft. long cost $1.12. One of the same width and thickness 9 ft. long will cost how much?

8. How much should be received for $3\frac{1}{2}$ bu. of potatoes @ 30¢ a peck?

9. Through how many degrees does the second hand of a watch turn in 15 seconds?

10. How much postage is required for a bundle of magazines weighing 3 lb. 5 oz. sent by you?

a. How much per year is the interest on $1000 @ 3%? What sum @ 3% will yield an annual income of $1200?

CLXVIII. REVIEW

1. When it is 9 A.M. in San Francisco, what time is it in Paris?

2. Find the cost of 60 geographies @ 50¢ less $16\frac{2}{3}\%$.

3. Find the cost of a pile of wood 4 ft. by 8 ft. by 20 ft. @ $7?

4. Find the proceeds of a note for $800 for 3 months, discounted at a bank.

5. How much is the postage on a half-ounce letter?

6. How many square feet in a floor 12 ft. 6 in. by $20\frac{1}{3}$ ft.?

7. How many years, months, and days from Nov. 12, 1908, to Jan. 18, 1911?

8. Find the cost at 8¢ a foot of a base-board 8 in. wide for a room 15 ft. by 25 ft., with 14 ft. taken up by doorways?

9. How many strips of paper are required for the walls of a room 13 ft. by 17 ft., with 3 windows and 3 doors averaging 4 ft. wide?

10. A tax of $70,000 is to be raised on property valued at $5,000,000. It is to be raised on how many thousands? What part of it must be raised on $1000? How much must be raised on $1000?

a. A note for $800 with interest is dated January 8, 1910. November 8 $600 is paid on this note. How much remains unpaid?

b. A drawing was made 7 in. long and 3 in. wide, and reduced by photographing so that it was 4 in. long. How wide was it then?

c. December 5 $40 was deposited in a savings bank. Interest began when? When was the first dividend added? What was it?

d. Paint for 24 window screens cost 90¢, and a brush 15¢. A man worked 5 hours @ 25¢ per hour in painting them. How much was the average cost per screen for painting?

CLXIX. CIRCLE — CIRCUMFERENCE

The circumference of a circle equals about $3\frac{1}{7}$ times the diameter.

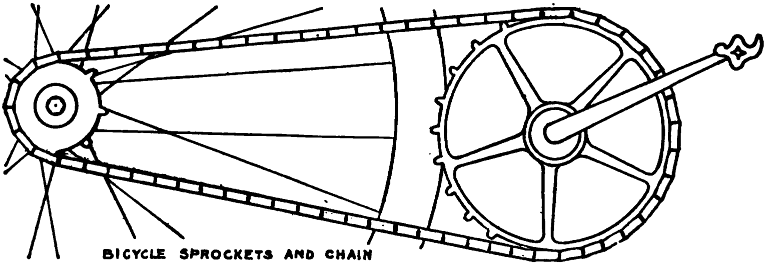
1. How many feet round a carriage wheel $3\frac{1}{2}$ ft. in diameter?

2. How far will the carriage move in 4 turns of this wheel?

3. A locomotive with driving-wheel 7 ft. high would go how far with each turn of the wheel? How far with 10 turns?

4. A bicycle with a 28-inch wheel will go how far with 1 turn of the wheel? A wheel twice as high will go how many times as far?

5. A 14-inch wheel will go how far with 1 turn?



BICYCLE SPROCKETS AND CHAIN

6. The small wheels of a bicycle with teeth on their rims and the chain carried on these wheels connect the pedals with the rear wheel. These small wheels are called **sprocket wheels.**

The larger sprocket wheel is joined to the pedals, and must turn with them, carrying the chain. The small sprocket wheel is joined to the rear bicycle wheel. The **teeth** in the sprocket wheels **fit into the links of the chain** so that **it cannot slip** on the wheels.

When the pedal is turned, what must the rear wheel of the bicycle do? What must the bicycle do?

7. At any turning of the pedal, how will the length of chain passing over the small sprocket compare with that passing over the large sprocket?

8. Will the small sprocket and the rear wheel make the same number of turns as the pedals, or more, or less?

9. The teeth on the two sprocket wheels are the same distance apart. There are 24 teeth on this large sprocket and 8 on the small one. How does the circumference of the large sprocket compare with that of the small sprocket?

10. How many turns will the small sprocket and the bicycle wheels make for 1 turn of the pedals?

a. The bicycle wheel is 28 in. high. How far will it go at 1 turn of the pedal?

b. How many times 28 in. high must a wheel be to go as far at 1 turn as this wheel goes at 1 turn of the pedal? How many inches high must it be?

c. The number of inches in the height of a wheel which will go as far at one turn as a bicycle will go at one turn of the pedal indicates the gear of that bicycle. What is the gear of this bicycle?

CLXX. REVIEW

1. Find the cost of 2 lb. 10 oz. of swordfish at 22¢.

2. What will 1800 lb. of potato fertilizer cost at $32.50 per ton?

3. What is a pile of wood 4 ft. by 24 ft. by 5 ft. worth at $10 per cord?

A pile of wood 4 ft. by 24 ft. by 4 ft. contains how many cords? Another foot in height adds what part of 3 cd.?

4. How many feet in a joist 2 in. by 4 in. by 12 ft.?

5. Find the bank discount and proceeds of a note for $400 for 60 d., dated Jan. 12 and discounted Feb. 11.

It is discounted how long before it is due?

6. Find the cost of waxing and polishing a floor 18 ft. by 25 ft. @ 12½¢ per square yard.

7. How many square yards in the walls of a room 18 ft. by 25 ft., and 9 ft. high?

8. Laths are commonly sold in bundles containing 100 each, and a bundle will cover 6 sq. yd. How many must be purchased to cover the walls of the above room?

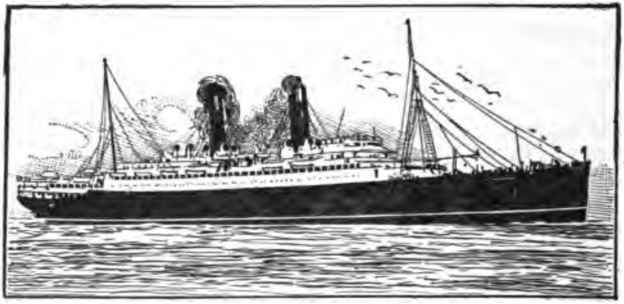
9. Find the cost of 40 arithmetics @ 40¢ less 20%.

10. How much is the postage on a pair of gloves weighing 3 oz.?

11. On a newspaper weighing 3 oz. sent by you?

12. Find the proceeds on 100 crates of tomatoes sold @ $1.50 on commission of 5%.

CLXXI. DIVISION



1. An ocean steamer left Queenstown at 10.40 A.M. Wednesday, and reached Boston at 11.30 A.M. the following Wednesday. How much time should you say the trip occupied?

The time of the trip was reported as approximately 7 days, 6 hours. How can the time reported be correct?

2. She carried about 2000 persons. According to the steward's report they ate during the seven days' voyage:

Eggs,	33,000.	Chickens,	1560 pounds.
Beef,	7700 pounds.	Pork,	2700 pounds.
Mutton,	3600 pounds.	Flour,	19,998 pounds.
Bacon,	2000 pounds.	Peas,	1400 pounds.
Sugar,	4480 pounds.	Coffee,	230 pounds.
Butter,	1200 pounds.	Tea,	250 pounds.
Cheese,	1050 pounds.	Biscuits,	27 barrels.

The average person ate how many eggs?

3. How many pounds of beef? How many of mutton?

4. Of bacon? Approximately how many of chicken?

5. Of pork? Of meat of all kinds?

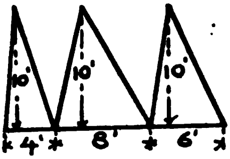
6. How many pounds of all kinds per day for each person?

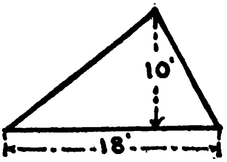
7. Keep a record of the meats used in your family for a week, and find how much the average quantity per day is for each person.

CLXXII. SURFACE — CIRCLES

1. Find the sum of the areas of the first 3 triangles.

2. Of the triangle at the right.

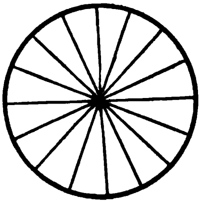




The area of a number of triangles with equal altitudes equals the area of 1 triangle having the same altitude and a base equal to the sum of the bases of the several triangles.

3. Find the area of the 3 at the left as 1 triangle.

By drawing numerous radii a circle may be divided into a large number of approximate triangles, all having their vertices at the center, and their bases forming the circumference. By increasing the number of these divisions they become practically triangles.



The area of a circle equals the area of the triangles whose united bases form the circumference of the circle and whose common altitude equals the radius.

It is equal to the area of a rectangle whose length equals the circumference and whose width equals half the radius.

4. What is the diameter of the above circle?

5. How long is its circumference?

6. How long is half the radius? How many square inches in the circle?

7. The diameter is 4 in. Find the circumference.

8. How much is half the radius? The area?

9. The diameter is 8 in. Find the circumference.

10. How much is half the radius? The area?

11. The diameter is 6 in. Find the circumference.

12. How much is the area?

a. How many square feet in the floor of a circular silo 21 ft. in diameter?

b. Find the circumference of a circle 16 ft. in diameter.

CLXXIII. REVIEW

1. How many cords in a pile of wood 4 ft. by 6 ft. by 16 ft.?

2. Find the circumference of a circle $3\frac{1}{2}$ in. in diameter.

3. Find its area.

4. At $18 a ton, what is the cost of a load of hay weighing 1050 lb.?

Find the cost of 1000 lb. and $\frac{1}{2}$ of 100 lb.

5. What is the cost of insuring a house for $2500 and furniture for $1000 for 3 yr. @ $\frac{1}{2}$%?

6. Find the cost of 6 lb. 5 oz. of lamb at 18¢.

7. How much should be received for 17 pr. of gloves @ 98¢?

Work this and the next 3 in the easiest ways.

8. Find the cost of 15 yd. of gingham @ $37\frac{1}{2}$¢.

9. Of 19 yd. of serge at 75¢.

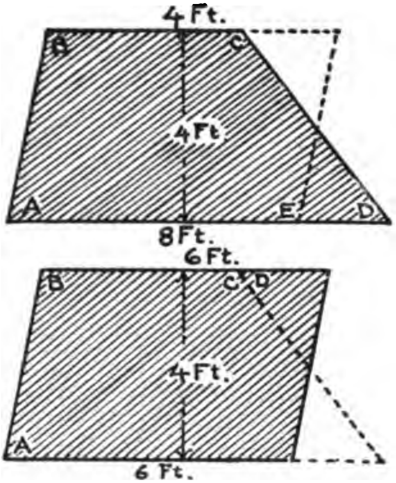
10. How many acres in a rectangular field 15 rd. by 18 rd.?

a. How many trees can be set 30 ft. apart in a row 60 rd. long?

b. How many acres does a lot 20 rd. by 60 rd. contain?

Instead of multiplying 60 by 20 and dividing the product by 160, we may omit 20, one of the factors of 160, and divide 60 by 8, the other factor of 160.

CLXXIV. SURFACE — TRAPEZOIDS



1. The figure *ABCD* is a trapezoid. How does it differ from a parallelogram?

2. Draw on paper a trapezoid of the same size and shape as *ABCD*. Letter it inside and cut it out.

3. From the middle point of *CD* draw a line parallel with *AB* and ending in *AD*. Cut along this line and carry *D* round to *C*. What form does this make?

4. How does the area of the parallelogram compare with that of the trapezoid?

5. How does the altitude of the parallelogram compare with that of the trapezoid?

6. What is the sum of the parallel sides of trapezoid? How does the length of the parallelogram compare with the sum of these sides?

The area of a trapezoid equals that of a rectangle of the same altitude as the trapezoid, with a base equal to half the sum of the parallel sides of the trapezoid.

7. What is the area of the above trapezoid?

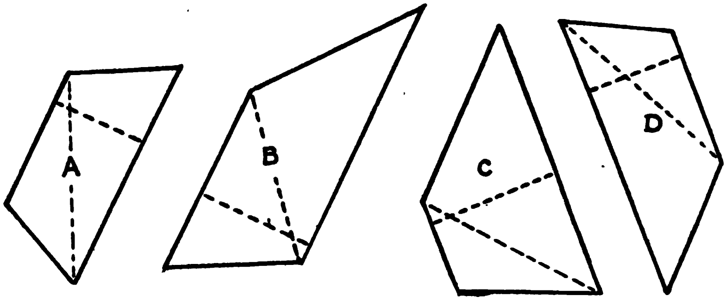
8. A field in the form of a trapezoid is 10 rd. wide, one of its parallel sides is 12 rd. long and the other 18 rd. What is half the sum of the parallel sides? How many square rods in the field?

a. If this field were but 8 rd. wide, what would its area be?

b. If it were 5 rd. wide?

c. Find the value of 100,000 barrels of oil @ 65¢.

CLXXV. SURFACE — TRAPEZOIDS



$\frac{1}{8}$in. = 1ft.

1. Think through CLXXIV.

2. Find the area of *A*.

3. Of *B*. 4. Of *C*. 5. Of *D*.

6. Of the triangle at the left of the dotted diagonal in *A*.

7. The parallel sides of a field in the form of a trapezoid are 15 rd. and 25 rd., and its width is 8 rd. How many square rods in it? How many acres?

Notice that the shorter of the parallel sides of the trapezoid is the base of this triangle, and the altitude of the trapezoid is the altitude of the triangle.

a. Find the area of the triangle at the right of the diagonal in *A*.

b. Of the triangle on the left in *B*.

c. Of the triangle on the right in *B*.

d. Find the cost of 12 yd. of cloth @ 37½¢.

e. 647 yr. = x decades 647 yr. = x centuries

CLXXVI. VOLUME OF CYLINDERS

Cylindrical Objects

1. A cylindrical can is 7 in. in diameter and 10 in. deep. What is the circumference of the base?

2. What is the area of the base?

In this work it is better to find ¼ of 3 × 22 sq. in. than 3 × ¼ of 22.

3. How many cubic inches in 1 layer on the base?

4. How many layers in the can?

5. How many cubic inches in the can?

6. About how many gallons (231 cu. in.) will it hold?

7. A cylindrical pitcher is 4 in. in diameter inside and 10 in. deep. What is the inside circumference of the base?

8. What is the area of the base?

9. How many cubic inches of water does it hold when filled to the brim?

10. How many cubic inches in 2 quarts of milk?

To find the volume of a cylinder:

Find the circumference of the base.

The number of cubical units in 1 layer resting upon the base.

The number in all the layers which the cylinder contains.

a. What is the amount of air pressure (at 15 lb. to the square inch) on each side of a circular disk 2 in. in diameter?

CLXXVII. REVIEW

1. What is the weight of the air (1 oz. per cubic foot) in a ventilating flue 2 ft. square and 40 ft. high?

In multiplying leave out the factors of 16, and the product will indicate the number of pounds.

2. When it is 6 A.M. at Chicago, what time is it at Greenwich, England? At Rome ($12\frac{1}{2}°$ E.)?

3. What is the circumference of a circle 4 rd. in diameter? What is the area of this circle?

4. $350 New York, Aug. 24, 1909.

Three months from date I promise to pay to the order of Samuel Burton $350, value received.

Allen C. Newton.

Samuel Burton discounts this note at a bank 1 m. after date. How much does he get for it?

5. On a bill amounting to $100, what is the difference between a straight discount of 40% and two discounts of 30% and 10%?

6. What per cent of the month of June is $\frac{3}{7}$ of a week?

7. Smith bought potatoes at $1 a bushel, and sold them at 35¢ a peck. What per cent did he gain?

8. At $30 per ton, find the cost of fertilizer for 400 young grapefruit trees, allowing $1\frac{1}{4}$ lb. to a tree.

9. How many pounds of water will a tank 1 ft. by 1 ft. by 6 in. hold?

Water is about 1000 times as heavy as air. A cubic foot weighs $62\frac{1}{2}$ lb.

a. Which is the lower price, 15¢ per dozen, or 25¢ for 20?

b. Which will cost more, 4 cantaloupes at 75¢ per dozen, or 4 grapefruit at 7¢ a piece? How much apiece more?

c. There were discounts of 90% and 10% from the list price of a case of glass. The net price was what per cent of the list price?

CLXXVIII. REVIEW

1. A cylindrical silo is 14 ft. in diameter and 30 ft. deep. What is the circumference of the base?

2. What is the area of the base?

3. How many cubic feet of ensilage in it when it is $\frac{1}{3}$ full?

4. If there are 50 cu. ft. of ensilage in a ton, about how many tons of ensilage in the silo?

5. A 3-inch cube is what part of a 4-inch cube?

6. What is a pile of wood 4 ft. by 5 ft. by 64 ft. worth @ $7?

7. Find the cost of 2 lb. 3 oz. of halibut @ 24¢.

8. Find the interest of $700 for 3 yr. 9 m. @ 4%.

a. A lot of furniture was insured for $2500 for 2 yr. at $\frac{1}{2}$%. It was destroyed by fire. A list of the articles with values amounting to $3000 was furnished to the insurance company and accepted by it. Did the owner lose anything by the fire? If so, how much? Did he save anything by insuring? If so, how much? If he had not insured, how much would he have lost?

CLXXIX. REVIEW

1. March 10 $100 was deposited in a savings bank. When does interest begin? How much is the first dividend? The new principal?

2. How much will a post-office money order for $97.50 cost?

3. A note for $600 for 3 m. is discounted at a bank 1 m. from date. Find the proceeds.

4. If 750 shingles cover a space 10 ft. by 10 ft. on the side of a building, how many shingles must be bought to cover a side 40 ft. by 10 ft.?

5. A town has property valued at $5,000,000 on which to raise a tax of $75,000. How many thousands are there on which to raise the $75,000?

6. What part of it must be raised on 1 thousand?

7. How much must be raised on $1000? On $2000?

8. How much is the tax on property valued at $2500?

9. If a discount of 2% is allowed for prompt payment, how much is the discount? How much is the net tax?

10. How many cubic inches of mercury will a jar 2 in. in diameter and 5 in. deep (inside measurement) hold?

a. Find the cost of wall paper @ 25¢ a roll and border @ 6¢ a yard for a room 12 ft. by 18 ft., with 3 windows and 4 doors, if a roll of the paper makes 3 strips?

b. Find the cost of lathing and plastering the ceiling of the above room @ 40¢ per square yard.

c. Find the cost of 10 geographies @ 75¢ less $16\frac{2}{3}$%.

d. A chicken weighing 4 lb. 8 oz. cost 90¢. One weighing 6 lb. will cost how much?

e. One side of a roof is 27 ft. by 20 ft. How many feet of boards must be bought to cover it if there is a waste of 10% in matching?

f. What is the area of the inner curved surface of a pitcher 4 in. in diameter and 10 in. deep?

g. What is the area of its base?

CLXXX. REVIEW

1. How many rolls of paper are required for a room 12 ft. by 16 ft., with 3 windows and 3 doors, if 1 roll will make 3 strips?

2. Through how many degrees does the hour hand of a clock turn in 2 hours?

3. When it is 6 A.M. in Philadelphia, what time is it in Paris (2° east)?

4. Find the proceeds on 400 boxes of grapefruit sold @ $3 on commission of 5% with freight charges of 50¢ per box.

5. How much is the postage on a package of fruit weighing 2 lb. 9 oz.?

6. On a registered letter weighing 1½ oz.?

7. On a package of printed matter weighing 1 lb. 10 oz.?

8. On a magazine weighing 12 oz. sent by you?

9. How many acres in a lot in the form of a trapezoid whose parallel sides are 24 rd. and 36 rd. long, and 16 rd. apart?

10. Six quarts of crab-apples @ 60¢ a peck and 4 lb. of sugar at 6½¢ make 12 glasses of jelly. How much do the ingredients cost? How much per glass?

11. If the tumblers cost 25¢ per dozen, how much is the cost per glass for jelly and tumbler?

12. What per cent is saved by buying a 25-dollar suit after it was marked down to $15?

13. A man pays $3 for ½ cd. of wood and employs a man @ 20¢ an hour in sawing and splitting it from 7 A.M. to 3.30 P.M. less 1 hour at noon time. What is the total cost per cord?

14. Find the cost of a board 10 in. by 12 ft. @ $65 per M.

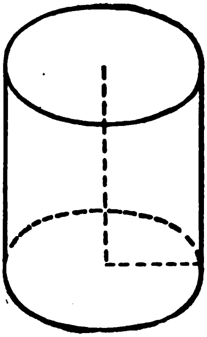
Make a problem to find the cost of ice for the refrigerator at 40¢ per 100 lb.

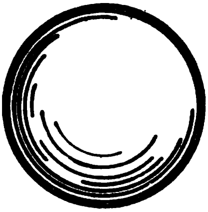
a. Four boys used in preparing their breakfast ¼ pkg. cream of wheat @ 12¢, 1 jar cream, 15¢, ¼ lb. of sugar @ 6¢, $\frac{1}{10}$ pkg. wheat coffee @ 20¢, 1 doz. corn muffins @ 10¢, 1 pt. milk @ 8¢ a quart, and ½ pt. kerosene @ 16¢ per gallon. What is the total cost?

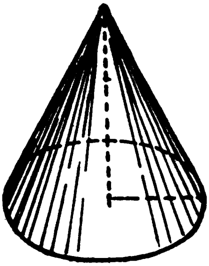
b. Ned's hens furnished him an average of 8 eggs a day for 4 weeks, and he sold them at 30¢ a dozen. If the food which he bought for them cost 72¢, how much did he get for taking care of them?

c. Find the cost of 16 hens @ $1.12½.

CLXXXI. CYLINDERS — CONES — SPHERES







By measuring with hollow cylinders, cones, and spheres of the same diameter and with an altitude equal to the diameter, **the cylinder is found to hold 3 conefuls of water, and the sphere 2 conefuls.**

1. The volume of a cone equals what part of that of a cylinder of the same diameter and altitude?

2. The volume of a sphere equals what part of that of a cylinder of the same diameter with an altitude equal to the diameter?

3. Find the circumference of the base of a cylinder 7 ft. in diameter. Find the area of the base.

4. The cylinder is 7 ft. high. Find its volume.

5. A cone of the same diameter and altitude will contain how many cubic feet?

6. Find the volume of a sphere of the same diameter.

7. Find the circumference of a cylinder 4 in. in diameter. Find the area of the base.

8. The cylinder is 4 in. high. Find its volume.

9. What is the volume of a cone of the same dimensions?

10. What is the volume of a sphere of the same diameter?

11. Find the volume of a cone 4 ft. in diameter and 4 ft. high.

12. Find the volume of a sphere of the same diameter.

a. Find the circumference of a cylinder 6 in. in diameter. What is the area of the base?

b. The cylinder is 6 in. high. Find its volume.

CLXXXII. CYLINDERS — CONES — SPHERES

1. The volume of a cone equals that of a cylinder of the same diameter with an altitude what part as great?

For the volume of a cone we may find the volume of a cylinder of the same diameter and $\frac{1}{3}$ as high.

2. What is the circumference of the base of a cone $3\frac{1}{2}$ ft. in diameter?

3. Find the area of the base.

4. This cone is 6 ft. high. Find its volume.

5. The volume of a sphere equals that of a cylinder of the same diameter with an altitude what part as great as the diameter?

For the volume of a sphere we may find the volume of a cylinder of the same diameter with an altitude $\frac{2}{3}$ as great as the diameter.

6. Find the circumference of a circle 3 in. in diameter.

7. Find the area of the circle.

8. Find the volume of a sphere of the same diameter.

9. Find the volume of a cone 3 in. in diameter and 3 in. high.

10. Find the circumference of a circle 28 ft. in diameter.

a. Find the volume of a cylinder 4 in. in diameter and 3 in. high.

b. Find the volume of a cone of the same diameter and height.

CLXXXIII. REVIEW

1. Find the volume of a cone 2 ft. in diameter and 6 ft. high.

2. How many feet in 2 joists each 2 in. by 6 in. by 14 ft.?

3. What will a deposit of $800 in a savings-bank June 16 amount to Oct. 1?

4. Find the dividend for Apr. 1 following. Find the amount.

5. Find the proceeds of a note for $1000 for 1 m. discounted at a bank.

6. How much is 1800 lb. of hay worth at $16?

7. How many square rods in a field in the form of a trapezoid whose parallel sides are 17 rd. and 21 rd., and 10 rd. apart?

8. Find the cost of 10 lb. 2 oz. of turkey @ 22¢.

9. Find the cost of 25 elementary geographies @ 75¢ less 20%.

How much is the net price of 1 geography?

10. How many strips of wall-paper are required for a room 15 ft. by 18 ft. with 4 windows and 4 doors?

a. About how many gallons will a tank 2 ft. by 2 ft. 6 in. by 2 ft. hold?

b. About how many pounds of water will it hold?

c. If the room mentioned in 10 is 8 ft. high, about how many pounds of air will it hold?

d. The lot in 7 contains how many acres?

e. The electric light meter indicates the use of 20 watt hours of light in June. Find the net cost at 15¢ per w. h., allowing 20% for prompt payment.

f. The electric light meter indicates the use of 12 watt hours of light in July. What is the net cost at 15¢ per w. h. if a discount of 20% is allowed for prompt payment?

CLXXXIV. REVIEW

1. How many cubic yards of earth must be removed in excavating a cellar 30 ft. by 45 ft. and 5 ft. deep?

Think dimensions in yards.

2. When it is 6 o'clock A.M. at Greenwich, England, what time is it at San Francisco?

3. Find the circumference of a circle 12 ft. in diameter.

4. Find the area of the circle.

5. The volume of a cone 12 ft. in diameter and 12 ft. high.

The volume of a sphere 12 ft. in diameter.

The volume of the cone equals that of a cylinder of what dimensions? The volume of the sphere equals that of a cylinder of what dimensions?

6. How much is the postage on a package weighing 3¼ oz. and containing a little written matter?

7. On a package of printed circulars weighing 3¼ oz.?

8. A tax of $140,000 is to be raised upon property valued at $7,000,000. How much must be raised upon $1000?

9. What is the tax in this town upon land valued at $2000 and buildings valued $3000 with a poll-tax of $2?

10. What is the tax on $1000 in a town with a valuation of $1,000,000 and a tax of $15,000 to be raised upon property?

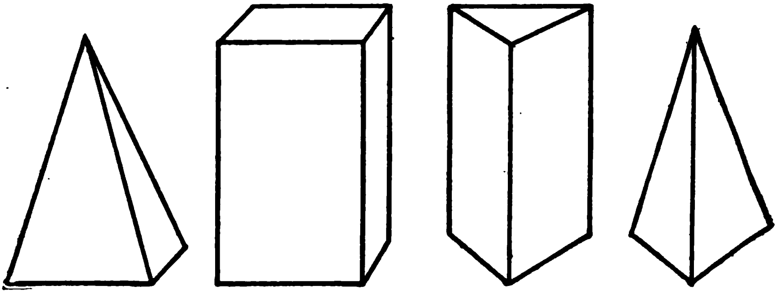
Write for the next lesson a problem suited to your grade which came up outside of books and schools.

a. What per cent is gained by buying crayons at 7¢ a gross and selling them at 3¢ a dozen?

b. In a school of 40 pupils $620 is paid for teaching, $80 for books and supplies, and $200 for fuel and care. What is the total cost per pupil?

c. How much is gained on 250 bu. of potatoes bought at 60¢ a bushel and sold at 20¢ a peck?

CLXXXV. PRISMS — PYRAMIDS



1. How does the volume of a cone compare with that of a cylinder of the same base and height?

2. How do you think the volume of a pyramid compares with that of a prism of the same base and height?

By increasing the number of sides of the prism and pyramid indefinitely they become practically cylinders and cones.

3. Find the volume of a pyramid 9 ft. high with a base 4 ft. square.

4. Of a pyramid 30 ft. high with a rectangular base 12 ft. by $8\frac{1}{3}$ ft.

5. How many square feet in the sides of a pyramid 7 ft. square whose slant height (altitude of a triangular side) is 20 ft.?

How many of these triangular sides? What is the total length of their bases?

6. How many square feet in the entire surface of this pyramid?

7. How many square feet in the entire surface of a prism of the same base as the pyramid, with an altitude equal to the slant height of the pyramid?

8. Find the area of the entire surface of a pyramid 6 ft. square whose slant height is 12 ft.

9. What is the area of the entire surface of a prism whose bases are each equal to the base of the above pyramid and whose height equals the slant height of the pyramid?

10. If the base of a pyramid equals one base of a prism and the slant height of the pyramid equals the height of the prism, how does the entire surface of the pyramid compare with that of the prism?

a. Find the area of the bases of a cylinder 6 ft. in diameter.

d. How many bricks 2 in. by 4 in. by 8 in., laid upon one "edge" (narrow side), are required to pave a sidewalk 10 ft. by 100 ft.?

How many are required for 1 sq. ft.?

CLXXXVI. REVIEW

1. How many square feet in the sides of a pyramid whose base is 10 ft. square and whose slant height is 40 ft.?

2. What is the area of the whole surface?

3. Find the circumference of a cylinder 4 yd. in diameter.

4. This cylinder is 6 yd. high. If its convex (curved) surface could be unrolled and laid out flat, what would its shape be? How long is the surface? How wide?

5. How many square yards in its convex surface?

6. When it is 10 A.M. in Philadelphia, what is the time in Rome (12½° E.)?

7. A stand-pipe is 28 ft. in diameter and 10 ft. high. Find its circumference. How many square feet in its convex surface?

8. At $2.50 a rod, what will a mile of wall cost?

9. Find the cost of a ham weighing 20 lb. 14 oz. @ 20¢.

10. How much is the postage on ½ lb. of garden seeds?

a. How many square rods in a semicircular lot whose radius is 7 rd.?

$3\frac{1}{7} \times 7$ rd. = the semi-circumference. The area equals the area of a rectangle whose length equals the semi-circumference and whose width equals half the radius.

b. If a train leaves New York for Chicago at 3 P.M. and runs at the rate of 40 mi. an hour, and another leaves at 6 P.M., running at the rate of 50 mi. an hour, at what time will the second train overtake the first? How far from New York?

c. Find the cost of 15 histories @ $1.00 less 20%.

CLXXXVII. REVIEW

1. A note for $600 with interest was given Jan. 19, 1910. Nov. 19, 1910, $400 was paid on this note. What was the balance unpaid after this payment?

2. Find the circumference of a cylindrical tank 6 ft. in diameter and 4 ft. deep. The area of the base. The volume.

3. How many cubic feet in a cone 6 ft. in diameter and 6 ft. high? (Easiest way.)

4. In a sphere 6 ft. in diameter? (Easiest way.)

5. In a square prism 6 ft. square and 9 ft. high?

6. May 6, 1910, $800 was deposited in the Provident Savings Bank. When is the first interest added? How much is the amount?

7. How many cords in a pile of wood 4 ft. by 48 ft. by 8 ft.?

8. At 25¢ per square yard, what is the cost of plastering the ceiling of a room 18 ft. by 24 ft.?

9. How many strips of carpeting 27 in. wide will be required for a room 20 ft. wide?

10. A tax of $18,000 is raised on a valuation of $2,000,000. What is the tax on $1000?

Make a problem to find the cost of milk for May.

a. How many cubic feet of water will a rectangular tank 2 ft. by $3\frac{1}{3}$ ft. by $1\frac{1}{2}$ ft. hold?

b. How many gallons? How many pounds?

CLXXXVIII. CONVEX SURFACE OF CONES

1. What is the area of the lateral surface (sides) of a pyramid whose base has 10 sides, each 2 in., and the slant height of whose sides is 10 in.?

2. If the base has 20 sides of 1 in. each, and the slant height is 10 in., what is the area of the lateral faces?

3. Suppose the base has 40 sides, each $\frac{1}{2}$ in. How great is the lateral surface?

4. If the base has 80 sides, each $\frac{1}{4}$ in., what is the area of the lateral surface?

5. If the base has 160 sides, each $\frac{1}{8}$ in., how great is the lateral surface?

6. If it has 320 sides, each $\frac{1}{16}$ in., what is the lateral surface?

7. If the circumference of the base of a cone is 20 in. and the slant height 10 in., what is the area of the convex surface?

8. What is the area of the convex surface of a cone whose slant height is 10 in. and the diameter of whose base is 7 in.?

9. What is the area of the base? Of the whole surface?

10. What is the area of the convex surface of a cone the diameter of whose base is 14 ft. and whose slant height is 20 ft.?

The convex surface of a cone equals the surface of a rectangle whose length equals the circumference of the base and whose width equals half the slant height of the cone.

a. What is the area of the base of the cone in 10?

b. At $30 per M, find the cost of outside sills 6 in. by 8 in. for a house 30 ft. by 40 ft.

CLXXXIX. REVIEW

1. Find the area of the convex surface of a cone 3½ ft. in diameter with a slant height of 8 ft.

2. A man deposited $60 in a savings-bank Mar. 20. How much has he in the bank Oct. 3?

3. A note for $80 with interest on demand was given Jan. 10. March 10 $50 was paid upon this note. How much remained unpaid?

4. Find the premium for insuring a house for $2800 @ ¾%.

5. A tax of $56,000 is to be raised in a certain town upon property valued at $4,000,000. How much must be raised upon each thousand dollars of the valuation?

6. How much upon an estate valued at $6200?

7. How much are the proceeds from the sale of 200 bl. of potatoes @ $3 on a commission of 5% with freight expenses of 50¢ per barrel?

8. How many board feet in 6 planks, each 3 in. by 12 in. by 12 ft.?

9. When it is 12. M at Chicago, what time is it at New York? At Greenwich?

10. How much is the postage on a registered 3-pound package of books?

a. Find the cost of $5000 Union Pacific 4's @ 103.

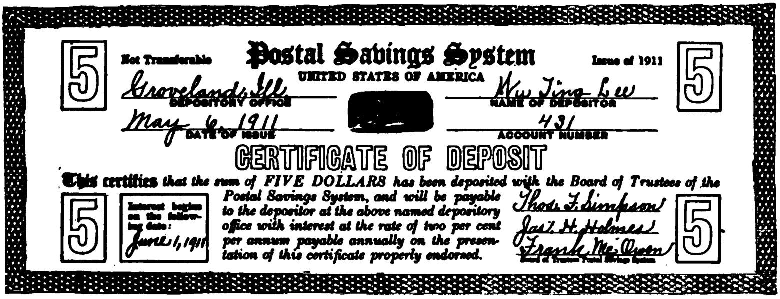
b. At $60 per M, what will boards for a floor 28 ft. by 30 ft. cost if you add 10% for waste?

c. A deposit of $400 is made in a savings bank Sept. 25. How much did it amount to Oct. 1 of the next year?

CXC. POSTAL SAVINGS SYSTEM

A Postal Savings Depository was opened January 3, 1911, at one post office in each state in the Union, to ascertain if there is a demand for such depositories. These have been used, and others are being established.

The **expense** of these depositories is **borne by the government** and **deposits are not taxable. Any person ten years of age or older who uses the post office** in which a depository is established **may deposit any entire number of dollars from 1 to 500** and receive certificates for the amount. **Deposits,** in amounts from **$20** to **$500, may be exchanged for 2½% Postal Savings Bonds.** The government furnishes the banks blank deposit certificates for $1, $2, $5, $10, $20, and $50.



5 Not Transferable **Postal Savings System** Issue of 1911 5

UNITED STATES OF AMERICA

Groveland, Ill.
DEPOSITORY OFFICE

Wu Ting Lee
NAME OF DEPOSITOR

May 6, 1911
DATE OF ISSUE

431
ACCOUNT NUMBER

CERTIFICATE OF DEPOSIT

This certifies *that the sum of FIVE DOLLARS has been deposited with the Board of Trustees of the Postal Savings System, and will be payable to the depositor at the above named depository office with interest at the rate of two per cent per annum payable annually on the presentation of this certificate properly endorsed.*

5

Interest begins on the following date: June 1, 1911

Thos. F. Simpson
Jas. H. Holmes
Frank McQueen
Board of Trustees Postal Savings System

5

1. Read this certificate carefully, and compare it with a silver certificate in regard to who issues it, to whom payable, and interest.

2. Is this rate of interest higher, or lower than is paid by savings banks organized under state laws in your vicinity? Why should any choose to use the postal savings depositories?

3. Find the interest on this deposit of $5 to Feb. 1, 1912.

4. A deposits $13 in a postal savings bank Feb. 1. How many certificates must be issued to him? What is the amount of each?

5. When does interest on this deposit begin? Find the interest for 1 yr. Accrued interest bears no interest.

CXCI. REVIEW

1. Find the cost of 2250 lb. of hay at $16 per ton.

2. I buy dry goods to the amount of $6.37, and give in payment 2 five-dollar bills. What should the dealer say in counting out the change?

3. To inclose a square field, 320 rd. of fence are required. How long is one side? How wide a strip of land along one side equals an acre? How many acres in the field?

4. How many acres in a lot 40 rd. by 60 rd.?

How wide a strip 40 rd. long equals an acre? How many such strips in the field?

5. Find the convex surface of a cone whose base is 21 ft. in diameter and whose slant height is 40 ft.

6. Find the interest of $12 for 1 yr. 4 m. at 6%.

7. What will $\frac{1}{2}$ ton of sugar cost at $.0625 per pound?

8. What will 5 bu. of nuts cost @ $3 less 5% for cash?

9. A man collects bills for me amounting to $640, and I pay him $12\frac{1}{2}$%. How much do I realize?

10. Find the difference between $\frac{1}{2}$ of 20 and $20 \div \frac{1}{2}$.

a. How many square rods in a lot $10\frac{3}{8}$ rd. long and $4\frac{1}{2}$ rd. wide?

b. How many half-pint mugs can be filled from $3\frac{5}{8}$ gal. of milk?

c. Estimate in inches the length of the lines on this page.

d. Estimate how many inches it is from the upper edge of the upper line to the lower edge of the lower line.

e. Find the volume of a sphere 6 in. in diameter.

f. Find the volume of a cone of the same diameter and 12 in. high.

g. On a map of Massachusetts Springfield measures $7\frac{1}{2}$ in. from Boston. If 1 in. on the map represents $11\frac{1}{4}$ mi., how far apart are these two cities represented?

CXCII. REVIEW

1. A conical hopper in a grain mill is 4 ft. in diameter at the top. Find its circumference. How many square feet would there be in a cover for the hopper?

2. How many cubic feet will it contain if it is 3 ft. deep?

3. A bushel contains nearly 1¼ cu. ft. About how many bushels will the above hopper contain without heaping?

4. About how many would a cylindrical bin of the same diameter and depth contain?

5. How many laths (100 to 6 sq. yd.) are required for the walls of a room 4 yd. by 6 yd., and 3 yd. high?

6. Through how many degrees does the hour hand of a clock move in 2 h.? Through how many degrees does the earth turn in 2 h.?

7. A tax of $90,000 is raised on a valuation of $6,000,000. How much is raised on $1000?

8. At the above rate, how much is the tax on land valued at $1200 and buildings valued at $2000, $2500, and $2300?

9. Find the cost of 10 histories @ 65¢ less 20%.

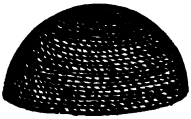
10. Find the area of a circle 6 ft. in diameter.

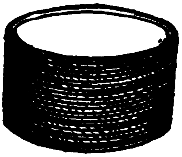
a. How many cubic feet of air will a sphere 6 ft. in diameter displace? How does this compare with the volume of a cone 6 ft. in diameter and 12 ft. high?

b. A deposit of $400 was made July 5, 1909, in a savings bank. When did it begin to bear interest? When was the first dividend made? What is the amount of the dividend? How much has the depositor in the bank after this dividend is made?

c. How much has he in the bank after the next dividend is made?

CXCIII. SURFACE OF A SPHERE — REVIEW





1. By winding a string over the surface of a hemisphere and then over the convex surface of a cylinder of the same diameter and height as the hemisphere, we may show that the convex surface of the hemisphere equals that of the cylinder.

2. What does the surface of the other half of the sphere equal?

3. What does the entire surface of the sphere equal?

The area of the surface of a sphere equals the area of the curved surface of a cylinder of the same diameter with an altitude equal to its diameter.

4. Find the area of the surface of a sphere 2 in. in diameter.

5. Find the area of the entire surface of a cylinder of the same dimensions.

6. Find the volume of the cylinder.

7. Find the volume of a cone of the same dimensions.

8. Find the volume of the sphere.

9. Find the surface of a sphere 4 in. in diameter.

10. Of a cylinder of the same dimensions.

How do the volumes of the sphere and cylinder compare?

a. What does the pressure of the air (15 lb. to the square inch) upon all sides of a $\frac{1}{2}$-inch cube equal?

b. On a demand note for $1200, with interest, given Sept. 12, 1910, $1000 was paid Jan. 12, 1911. What was the balance unpaid?

c. Find the entire surface of a cone 4 in. in diameter whose slant height is 8 in.

CXCIV. REVIEW

1. At 25¢ a yard, what is the cost of plain matting, yard wide, for the floor of a room 18 ft. by 20 ft. 6 in., if the strips are made 6 in. longer than the room for turning the ends under?

Think the dimensions in yards.

2. What are the proceeds of a note for $500 for 3 m. discounted at a bank?

3. Winning 16 games out of 24 is winning what per cent?

4. At 15¢ a dozen, how many bananas can be bought for 25¢?

5. A dividend at the rate of 4% a year was made on a deposit of $800 in a savings-bank 3 m. after interest began. How much did the deposit then amount to?

6. Find the area of the surface of a sphere 7 ft. in diameter.

7. Sound travels through still air at the rate of 1080 ft. per second. When a flash of lightning is seen 3 seconds before the report is heard, approximately how far away is it?

8. How many strips of paper would be required for the walls of the room in 1, above, if there were no windows or doors?

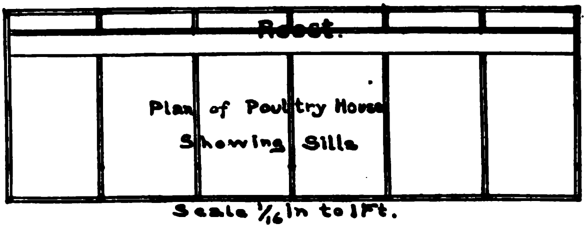
9. A teacher's salary is $660 per year of 40 wk. How much should she receive for teaching 2 wk.?

10. How many cords of wood in a pile 4 ft. by 6 ft. by 36 ft.?

a. Which will hold more, a gallon measure, or a cylindrical can 7 in. in diameter and 6 in. deep?

b. The diameter of the base of a conical roof is 21 ft., and the slant height is 20 ft. What is the area of the roof?

CXCV. LUMBER MEASURE



The sills of a building are the lowest part of the frame, placed horizontally. Those around the outside rest upon the foundation. Those reaching across the building inside are called **cross sills.**

1. How long are the end sills of this poultry-house?

2. How long are the side sills?

3. What is the total length of outside sills?

4. The sills are 3 in. thick and 6 in. wide. There are how many board feet for each foot in length?

5. How many feet of lumber in all outside sills?

6. How much will this lumber cost @ $20 per M?

7. What is the total length of cross sills?

8. These are 2 in. by 4 in. How many board feet in them?

9. How much will this lumber cost @ $20 per M?

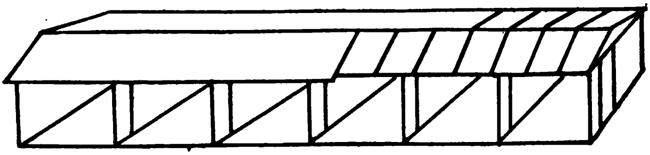
10. There are posts at the corners of the building, at the ends of the cross sills, one for a gate on each cross sill, and 2 at the right end of the building for a doorway. How many are there in all?

11. The posts are 2 in. by 4 in., and 5 ft. 6 in. long. But joists come in such lengths that we must reckon 6 ft. of length of post in finding the cost. How many feet of lumber must be bought for each post?

12. How many for all the posts?

13. How much would this cost @ $20 per M?

CXCVI. LUMBER MEASURE



The plates of a building are the parts of the frame which rest upon the posts and support the roof. In this building they are of the same number and size as the outside sills. The ties correspond to the cross sills, and are of the same number and size.

1. **The rafters are the roof frame.** Their lower ends rest upon the plates. In this building they are 3 ft. apart, from the middle of one to the middle of the next. Two rafters, one on each side, form a pair. How many pairs of rafters would be needed if the building were only 3 ft. long? If it were 6 ft. long? 9 ft. long? 12 ft. long? How many pairs does this building require?

2. Each pair has a rafter 8 ft. long for the front part of the roof, and one 12 ft. long for the back side. What is the total length of the 17 pairs of rafters?

3. They are 2 in. by 6 in. How many feet of lumber in them?

4. Boards on the sides and ends of this building are laid vertically. The common lengths of boards are 8 ft., 10 ft., 12 ft., 14 ft., and 16 ft. What length should be used for the rear side of the building to make the waste as small as possible?

5. What is the total width of boards required for that side?

6. How many board feet are required?

7. The ridge of the roof is 2 ft. above the plate. How long are the longest boards required on the ends? How long are the shortest?

8. What length of boards should be used on the ends, that each board may make 1 of the longest and 1 of the shortest required?

9. What is the total width of these boards required for the two ends? How many feet are required?

CXCVII. REVIEW

1. Find the cost of a load of hay weighing 1600 lb. @ $16 a ton.

2. How much is the postage on an 18-ounce package of manuscript for the printer?

3. What will a turkey weighing 10 lb. 11 oz. cost @ 20¢?

4. A carpenter works @ 45¢ an hour from 8 A.M. to 12, and from 1 to 3.40 P.M. How much does he earn?

5. Find the area of a circle 4 yd. in diameter.

6. What is the volume of a cone 12 yd. high whose base is 4 yd. in diameter? Work this in the easiest way.

7. Find the volume of a cylinder 4 yd. in diameter and 4 yd. high?

8. Of a sphere 4 yd. in diameter.

9. A bicycle with 28-inch wheels has 25 teeth on the large sprocket-wheel and 7 on the small one. How many times do the wheels turn with 1 turn of the pedals? See page 122.

10. When it is 12 o'clock M. in Washington, D. C., what time is it in Paris (2° E.)

a. A field twice as long as it is wide requires 240 rd. of fence to inclose it. How many acres in it?

b. If the driving-wheel of a locomotive is 7 ft. high, how far will the train move at each forward and backward movement of the driving-rod?

c. How far will it go with 25 turns of the driving-wheel?

d. How many feet in a 2-inch plank 7 in. by 8 ft.

CXCVIII. REVIEW

1. What will 2 lb. 5 oz. of steak cost @ 28¢?

2. How much is the postage on a 9-ounce box of stationery?

3. If there are 16 risers (steps) in a stairway from one floor to another 9 ft. above, how many inches high is each riser?

4. Find the proceeds of a note for $200 for 30 days discounted at a bank.

5. A commission merchant sells 1000 melons @ 40¢. What does he receive for them?

6. His commission is 5%, and there is an expense of $205 for freight. What does the shipper receive?

7. Find the area of the surface of a sphere 3 ft. in diameter.

8. To cook rolled wheat, add $2\frac{1}{4}$ parts water to 1 part wheat. How much water should be added to $1\frac{1}{3}$ parts of wheat?

9. On a note for $150 on demand with interest, $100 was paid 6 m. after date. How much remained unpaid?

10. March 10 $80 was deposited in a savings-bank. When does it begin to bear interest? How much is the first dividend?

11. A tax of $44,000 is to be raised on property valued at $4,000,000. How much must be raised on $1000?

12. How much will 5 geographies cost @ $1.00 less 20%?

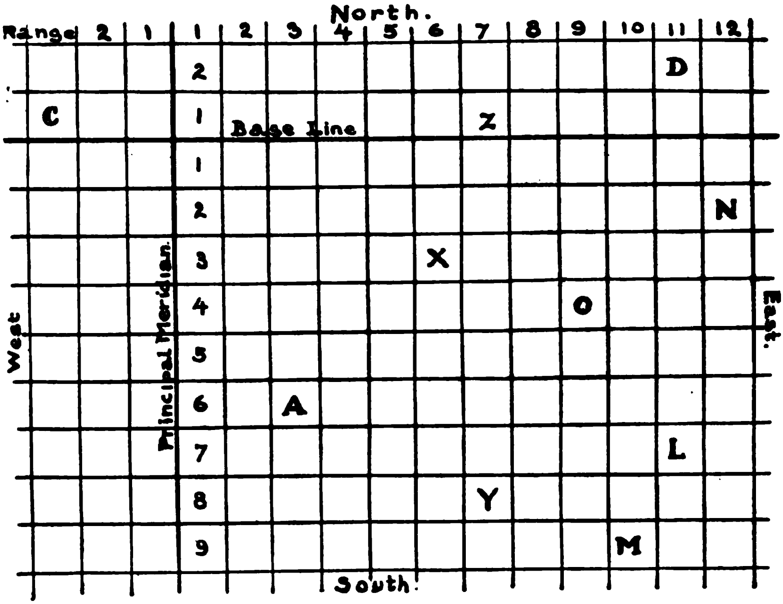
13. How many square yards in a porch roof 11 ft. by 18 ft.?

14. Find the cost of painting this roof @ 15¢ per square yard.

15. How many tumblers (half pints) will 1 gal. of jelly fill?

a. Find the area of a quarter circle whose diameter is 28 ft.

CXCIX. GOVERNMENT LAND — TOWNSHIPS



Townships

1. Land which has belonged to the United States has been laid out in townships 6 miles square.

2. For each state and territory in which there has been such land **a convenient east and west line has been taken as the** *base line,* and **a convenient north and south line as the** *principal meridian.*

3. Townships have been **numbered north and south from the base line.**

4. Rows of townships north and south are called *ranges,* and are **numbered east and west from the principal meridian.**

Township *A* is 6 south, Range 3 east.

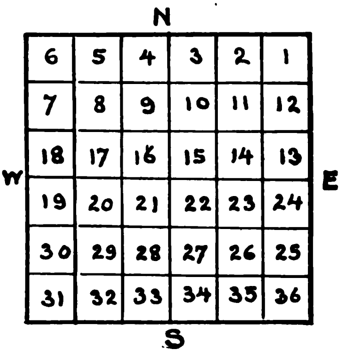
5. What is *L? D? C? O?* **6.** What is *M? X? Z?*

CC. GOVERNMENT LAND — SECTIONS — PARTS OF

1. **Each township is divided into square miles called** *sections*. How many sections are there in a township?

2. **Beginning with the northeast corner of a township, the sections are numbered west and east** as shown in the diagram.

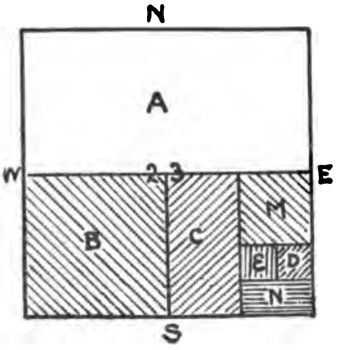
3. Draw a township, divide it into sections, and mark sections 23 and 30.



6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Sections of Township 6 S, Range 3 E

4. The lower diagram represents section 23 on a larger scale, divided into parts. *B* represents the S. W. quarter of section 23, Township 6 S., Range 3 E.



Parts of a Section

5. What does *A* represent?

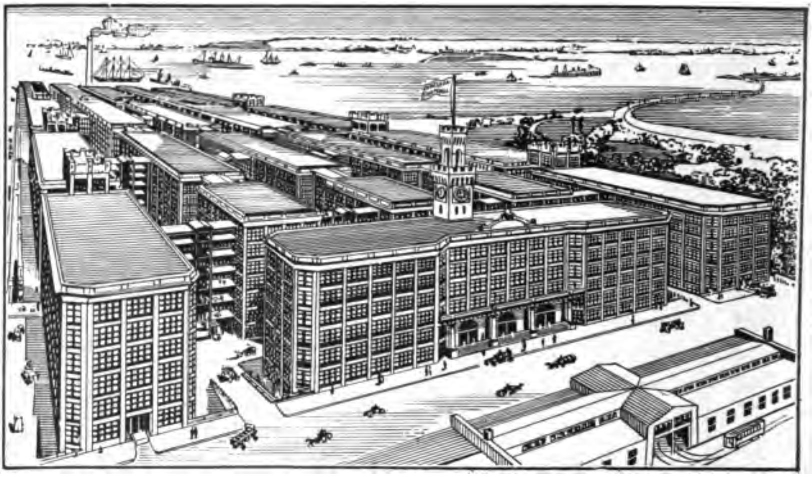
Make the description as definite and complete as that of *B* above.

6. *N* represents the S. half of the S. E. quarter of the S. E. quarter of section 23, Township 6 S., Range 3 E. What does *D* represent? What does *E* represent? *M?*

7. How many acres in section 23? In *A? B? C? M? N? D?*

8. Draw section 14 of this township, and divide it into quarters. Shade the N. E. quarter with north and south shade lines. Divide the S. E. quarter into quarters, and shade the N. W. quarter of the S. E. quarter with east and west shade lines.

CCI. STOCKS



Factory Colony

Few single individuals have the amount of capital necessary to build, equip, and operate a railroad, a steamship line, or a large factory. **For such enterprises it is usual for a number of persons to unite their capital.**

In accordance with the laws of some state **a corporation is formed, an organization authorized to do business as an individual.**

The capital, also called **stock, is divided into a certain number of equal parts, or shares.**

The shares are purchased by people who wish to invest in the business, **each purchaser receiving a certificate** that he is the owner of the number of shares which he has purchased.

These shares are bought and sold in the market on commission.

1. A corporation, with a capital of $120,000 in 1200 shares, is formed for the purpose of building and operating a cotton mill in Alabama. What is the face, or par, value of 1 share?

2. Shares sell in the market for more or less than the par value, according as the business is successful or unsuccessful, and as money-seeking investment is plenty or scarce.

When business is prosperous, will stock sell higher, or lower?

When money is scarce, how will prices be affected?

The business of a corporation is managed through a board of directors chosen by the shareholders.

3. A portion of the earnings of the mill is divided among the stockholders. For a time it is able to make dividends of 4% of the par value of the capital stock semi-annually. What income does an owner of 20 shares receive in a year?

4. If he paid the par value for his stock, what per cent does he realize on his investment?

5. What is the cost of 10 shares of this @ \$133⅓?

6. How much above par is this?

7. If the dividends continue the same, what per cent does this buyer realize upon his investment?

Eight dollars on \$133⅓ is how many dollars on \$100?

8. Suppose 10 shares were purchased through a broker at a commission of ¼% of the par value. How much is the commission per share? How much for the 10 shares?

9. What will 10 shares of American Telephone and Telegraph Co. cost at \$142¼ if purchased through a broker whose commission is ¼% of par value?

10. What will 100 Atch. T. & S. F. R. R. Co. cost at \$121 and commission of ¼% (of par value, \$100)?

11. Find the cost of 50 shares of Pacific Oil Co. @ \$3.50.

12. Find the cost of 100 Manhattan El. @ 134½.

a. Find the cost of 10 shares of N. Y., N. H. & H. @ 170½.

b. An 8-per cent stock purchased at \$160 per share, will pay what per cent upon the investment?

It pays \$8 on \$160. How much is it on \$100?

c. An agent's commission for selling goods at 5% was \$350. What were the proceeds?

5% = \$350 100% = x 95% (proceeds) = x.

d. Under what condition is the market price of a stock likely to rise?

CCII. REVIEW

1. A deposit of $200 was made in a savings bank Feb. 4. How much did it amount to Oct. 1?

2. How much are the proceeds of a note for $500 for 30 d. discounted at a bank?

3. A note for $200 on demand with interest was dated Sept. 10, 1910. It was paid Dec. 10. How much did it amount to?

4. Find the cost of a pile of wood 12 ft. by 4 ft. by 6 ft. @ $5 per cord.

A pile 12 ft. by 4 ft. by 4 ft. = x cd. A pile 12 ft. by 4 ft. by 6 ft. = x cd.

5. When 100 shares of stock are sold for $18,475, what is the price per share?

6. What was the commission on the above sale at $\frac{1}{2}$%?

7. A tax of $34,000 is raised upon property valued at $2,000,000. How much is raised upon $1000?

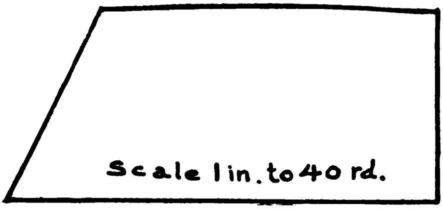
8. What is A's tax on land valued at $600 and buildings valued at $2400?

9. What are 1000 doz. of eggs per week for Feb., 1910, worth at 40¢ per dozen? Use the easiest way.

10. What is the volume of a cone 2 ft. in diameter and 2 ft. high? What is the volume of a sphere 2 ft. in diameter?

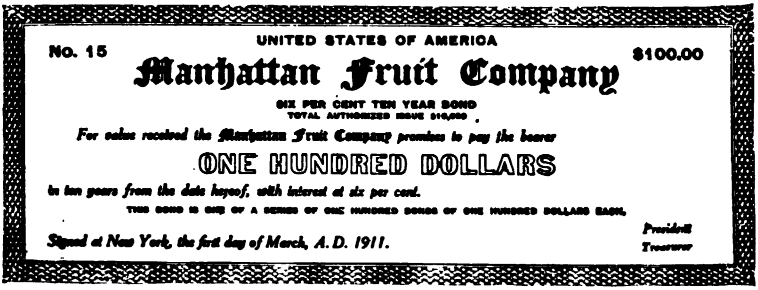
a. If there are 25 ice-creams to a gallon, what per cent can be gained by buying @ $1.25 per gallon and selling at 10¢ per plate?

b. How many acres in the lot shown in this figure? Easiest way.



c. Find the volume of a pyramid 10 ft. square and 30 ft. high.

CCIII. BONDS



UNITED STATES OF AMERICA

No. 15

$100.00

Manhattan Fruit Company

SIX PER CENT TEN YEAR BOND

TOTAL AUTHORIZED ISSUE $10,000

For value received the Manhattan Fruit Company promises to pay the bearer

ONE HUNDRED DOLLARS

in ten years from the date hereof, with interest at six per cent.

THIS BOND IS ONE OF A SERIES OF ONE HUNDRED BONDS OF ONE HUNDRED DOLLARS EACH.

Signed at New York, the first day of March, A.D. 1911.

President

Treasurer

Illustrative Bond

1. How much would the above bond cost @ 125% of its face value, without commission? How much is the commission for selling this bond @ $\frac{1}{4}$%?

Commission upon stocks and bonds is always reckoned upon the face value.

2. Find the cost of $1000 of American Tel. & Tel. 4's (4 per cent) at 104 (%) and commission of $\frac{1}{4}$%.

3. How much is the annual income from this bond?

4. Find the value of $1000 of Wisconsin Central 4's @ 94$\frac{1}{2}$.

5. Find the value of $15,000 of Northern Pacific 4's @ 102.

6. How much is the annual income from these bonds?

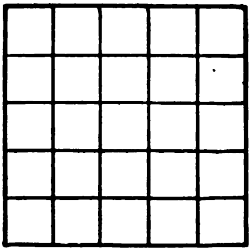
7. United States government bonds are not taxable. Others generally are. If the owner of the bonds in 6 above, paid a tax of $15 per thousand on their face value, how much per $1000 would his net income from them be?

8. The tax is what per cent of the face of the bonds?

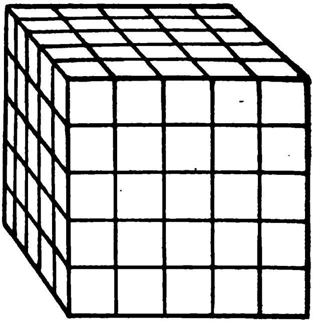
9. The net income is what per cent of the face of the bonds?

a. How much will 50 shares of Calumet & Hecla Mining Co. cost @ $661?

CCIV. POWERS AND ROOTS



$5 \times 5 = x$



$5 \times 5 \times 5 = x$

1. How do these factors compare?

A product of like factors is called a power.

One of the like factors of a number is called a root.

2. Of how many like factors is 25 the product?

A product of 2 like factors is the 2d power, or square.

3. What is the square of 9? Of 11?

One of the two like factors of a number is called the 2d root, or **square root**, of the number.

4. What is the square root of 64? Of 16? Of 144?

5. What is the square of 5? Of $5\frac{1}{2}$?

6. **A product of 3 like factors is called the 3d power, or cube.**

One of the 3 like factors is the 3d root, or cube root.

What is the cube of 4? Of 5?

7. What is the cube root of 64? Of 8? Of 27?

8. Other powers and roots are named from the number of like factors involved.

What power of 2 is 16? 32? 64? 128? 256?

9. What root is 2 of each of these numbers?

10. Find the squares of 15, 16, 20, 25, and 30.

CCV. SQUARES OF NUMBERS

The square of 3 may be expressed 3^2. The cube of 4 may be expressed 4^3.

$(1\frac{1}{2})^2 = 2\frac{1}{4}$ $15^2 = 225$
$(2\frac{1}{2})^2 = 6\frac{1}{4}$ $25^2 = 625$
$(3\frac{1}{2})^2 = 12\frac{1}{4}$ $35^2 = 1225$
$(4\frac{1}{2})^2 = 20\frac{1}{4}$ $45^2 = 2025$
$(5\frac{1}{2})^2 = 30\frac{1}{4}$ $55^2 = 3025$
$(6\frac{1}{2})^2 = 42\frac{1}{4}$ $65^2 = 4225$
$(7\frac{1}{2})^2 = 56\frac{1}{4}$ $75^2 = 5625$
$(8\frac{1}{2})^2 = 72\frac{1}{4}$ $85^2 = 7225$
$(9\frac{1}{2})^2 = 90\frac{1}{4}$ $95^2 = 9025$
$(10\frac{1}{2})^2 = 110\frac{1}{4}$ $105^2 = 11025$
$(11\frac{1}{2})^2 = 132\frac{1}{4}$ $115^2 = 13225$
$(12\frac{1}{2})^2 = 156\frac{1}{4}$ $125^2 = 15625$

1. What fraction occurs in each root at the left? What fraction in each power?

2. Notice that the square of $1\frac{1}{2}$ equals $(2 \times 1) + \frac{1}{4}$, and that $(2\frac{1}{2})^2$ equals $(3 \times 2) + \frac{1}{4}$. What numbers multiplied together produce the whole number of the square of $3\frac{1}{2}$?

3. What numbers multiplied together produce the whole number of the square of $4\frac{1}{2}$?

4. What produce the whole number of the square of $5\frac{1}{2}$?

5. What the whole number of the square of $6\frac{1}{2}$?

6. Of $7\frac{1}{2}$? Of $8\frac{1}{2}$? Of $9\frac{1}{2}$? Of $10\frac{1}{2}$? Of $11\frac{1}{2}$? Of $12\frac{1}{2}$?

7. $\frac{1}{2} \times \frac{1}{2} = x$. What power of $\frac{1}{2}$ is $\frac{1}{4}$?

To find the square of a whole number and a half, multiply the whole number by the next larger number and add the square of the half.

8. $15 = x$ tens $25 = x$ tens $35 = x$ tens $65 = x$ tens $95 = x$ tens $125 = x$ tens

Think of 15, 25, 35, etc. as $1\frac{1}{2}$ tens, $2\frac{1}{2}$ tens, etc.

Note that **tens multiplied by tens produce hundreds.** So $\frac{1}{2}$ ten × $\frac{1}{2}$ ten = $\frac{1}{4}$ hundred.

a. $(1\frac{1}{2}$ tens$)^2 = (2$ tens × ten$) + (\frac{1}{2}$ ten$)^2 = (20 \times 10) + 5^2 = 225$.

b. $(2\frac{1}{2}$ tens$)^2 = (3$ tens × 2 tens$) + (\frac{1}{2}$ ten$)^2 = (30 \times 20) + 5^2 = 625$.

c. $(3\frac{1}{2}$ tens$)^2 = (40 \times 30) + 25 = x$ $45^2 = (50 \times 40) + 25 = x$

d. $65^2 = (x \times x) + x = x$ $95^2 = (x \times x) + x = x$

CCVI. REVIEW

1. Find the square of $\frac{2}{3}$, $\frac{3}{4}$, $\frac{4}{5}$, $\frac{5}{6}$, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{7}$, $\frac{5}{7}$.

2. Find the square root of $\frac{4}{9}$, $\frac{1}{4}$, $\frac{9}{16}$, $\frac{25}{49}$, $\frac{9}{25}$.

3. Find the cube of $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{4}{5}$.

4. Find the cube root of $\frac{8}{27}$, $\frac{1}{8}$, $\frac{27}{64}$, $\frac{1}{125}$, $\frac{8}{125}$.

5. Find the fourth power of $\frac{1}{2}$, $\frac{2}{3}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{5}$.

6. Find the square of $\frac{1}{4}$, $\frac{4}{9}$, $\frac{1}{9}$, $\frac{1}{16}$, $\frac{9}{16}$, $\frac{1}{25}$.

7. The fractions given in 6 are what powers of those given in 5.

8. From your answers in 5 and 6 learn how the fourth power compares with the square of the second power, and state the fact.

a. How many square feet in a plat of ground 95 ft. square?

b. What is the value of this @ 25¢ per foot?

CCVII. REVIEW

1. How many square feet in a floor 35 ft. square?

2. In a building lot 65 ft. square?

3. What is the value of this @ 10¢ a foot?

4. How many square feet in a floor 15 ft. square?

5. Allowing for a loss of 20% from using matched boards, how many feet of boards are required to lay this floor?

6. Draw a township, divide it into sections, and number sections 16, 19, 21, and 35.

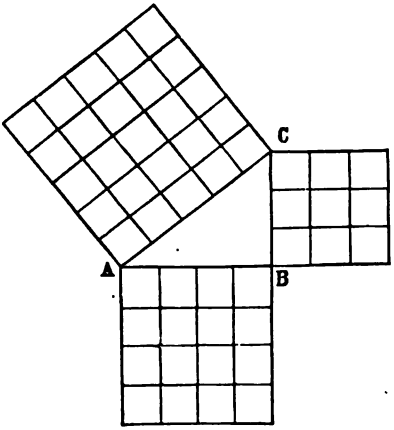
7. Draw a section of land, divide it into quarters, and mark off the southeast quarter of the northwest quarter.

8. How many acres in the tract marked off?

9. How much is the postage on a package of books weighing 2 lb. 7 oz.?

10. Find the cost of 1 lb. 4 oz. of cooked ham @ 34¢.

CCVIII. RIGHT-ANGLED TRIANGLE



1. In the triangle *ABC*, what kind of an angle is *B?*

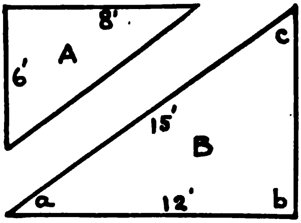
A triangle containing a right angle, is a **right-angled triangle.**

2. The side opposite the right angle, is called the **hypothenuse.**

How does the square of the hypothenuse compare with the sum of the squares of the other two sides?

The same is true of all right-angled triangles.

3. How can the square of the hypothenuse be found from the square of the other two sides?



4. The square of the hypothenuse of triangle *A* equals what?

5. How long is the hypothenuse?

6. If the squares of the hypothenuse and of another side are known, how can the square of the third side be found?

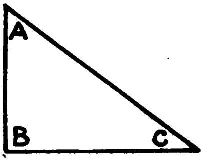
7. Find the square of *bc* in triangle *B*. How long is *bc?*

8. If in a right-angled triangle the hypothenuse is 50 rd. and another side 30 rd., how long is the third side?

a. $75^2 = (x \times x) + x^2 = x$ $85^2 = (x \times x) + x = x$

CCIX. TESTING RIGHT ANGLES BY HYPOTHENUSE

1. In *ABC*, how many quarter inches long is *BC?* *AB?* How long is the hypothenuse?



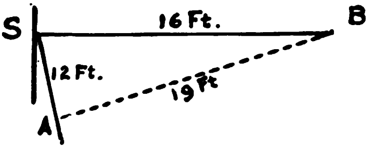
2. If *BC* were twice 4 units, and *AB* twice 3 units, how long would the hypothenuse be?

3. If *BC* were 3 times 4 units, and *AB* 3 times 3 units, how long would the hypothenuse be?

4. If *BC* were 4 times 4 units, and *AB* 4 times 3 units, how long would the hypothenuse be?

In a right-angled triangle, if one of the sides forming the right angle is a number of times 3 units long and another is the same number of times 4 units long, the hypothenuse is the same number of times 5 units long.

5. $AB = 15$ in., $BC = 20$ in., $AC = x$ in. $AB = 75$ ft., $BC = 100$ ft., $AC = x$ ft.



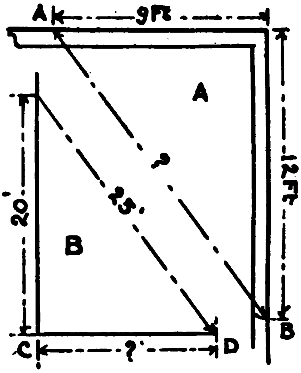
6-7. A line (cord) is stretched horizontally from the stake *S* to the right, as a guide for laying the foundation for the side of a house, and another is stretched from *S* toward you, as a guide for the foundation of an adjacent end. From *S* 12 ft. is measured off on one line ending at *A*, and 16 ft. on the other line ending at *B*. If the distance from *A* to *B* measures 19 ft., should it be increased or diminished to make the angle at *S* a right angle? How much?

a. Find the 4th root of 625.

The 4th root equals the square root of the square root.

b. What reason can you think of for naming the 2d power the square? For calling the second root the square root? What for the names cube and cube root?

CCX. REVIEW



1. If the angle in diagram *A* is a right angle, how long is *ab?*

2. If the angle in *B* is a right angle, how long is *cd?*

3. Find the cost of 25 yd. of cloth @ 98¢.

4. How many rods in $12\frac{1}{2}\%$ of a mile?

5. Find the circumference of a cylindrical tank 28 ft. in diameter.

6. If there is water 1 ft. deep in this tank, how many cubic feet of water does it contain?

7. A note for $200 with interest was dated Sept. 10, 1910, and $100 was paid Nov. 10, 1910. How much was the balance unpaid?

8. Find the cost of 3 lb. 9 oz. of steak @ 28¢.

a. Two carts are used in carting loam. It takes one man 10 minutes to load a cart, and 5 minutes to drive it out, dump the load, and return. The wages for a man are the same as for a horse and cart. Is it cheaper to let each driver load his cart alone, or to employ a third man to help each in turn? How much cheaper?

b. How many days from Jan. 1 to March 1, 1911?

CCXI. REVIEW

1. Find the proceeds of 100 baskets of peaches sold at 75¢ on commission of 5% with freight charges of 15¢ per basket.

2. How many strips of carpeting 27 in. wide are required for a room 19 ft. wide?

3. How many feet in 6 boards, each 8 in. wide and 12 ft. long?

4. Find the proceeds of a note for $400 for 30 d. discounted at a bank at date.

5. March 28 $400 is deposited in a savings-bank. How much is the amount of it Oct. 1?

6. How many square feet in the sides of a pyramid 12 ft. square with a slant height of 20 ft.?

7. How many cords in a pile of wood 4 ft. by 5 ft. by 32 ft.?

8. Find the cost of 600 lb. of hay at $22 per ton.

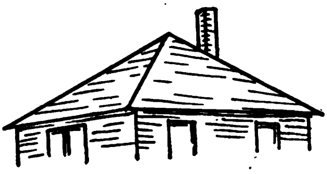
a. A tax of $20,000 is to be raised on property valued at $2,500,000. How much should be raised on each thousand dollars?

b. How much on real estate valued at $7000 and personal property valued at $5000?

CCXII. REVIEW

1. Find the proceeds of a $1000 bond sold at 110 by a broker on commission of $\frac{1}{4}\%$.

2. Find the cost of 50 third readers @ 50¢ less $16\frac{2}{3}\%$.



3. How many cubic feet of space are inclosed by a hip roof in the form of a pyramid 30 ft. square and 12 ft. high?

4. A salesman sells $\frac{7}{8}$ yd. of velvet @ $6, and receives a ten-dollar bill in payment. What should he say in counting out the change?

5. Will a 27-foot mast lie upon the floor of a room 15 ft. by 20 ft.? How long is the longest mast which will lie upon it?

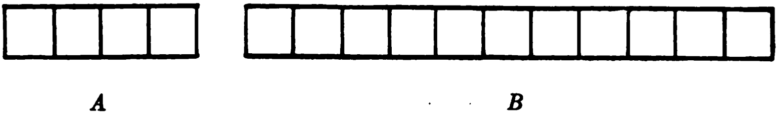
6. How much is the postage on a 2-pound package of seeds?

7. How many acres in half of a quarter section of land?

a. How long is the slant height of a hip roof in the form of a pyramid 32 ft. square and 12 ft. high?

b. How many square feet in this roof?

CCXIII. COMPARISON — RATIO



1. Compare *B* with *A*. $B = xA$

The quotient of one quantity divided by another of the same kind is often called the ratio of the one to the other.

2. What does the ratio of 15 yd. to 3 yd. equal? Of 2 qt. to 5 qt.? Of 7¢ to 2¢? Of 40 min. to 5 min.?

The division may be completed or expressed in fractional form.

It may also be expressed by the sign of division; and it has often been expressed by using the colon in place of the sign of division. Thus the ratio of 5° to 3° may be expressed 5° ÷ 3°, or 5°: 3°.

3. What does the ratio of 2 lb. to 8 oz. equal? Of 8 oz. to 2 lb.?

4. Of 4 yr. to 3 m.? Of 6 m. to 2 yr.? Of $2 to 25¢?

5. What does the ratio of 15¢ to 25¢ equal? If a dozen bananas can be bought for 15¢, how many should be obtained for 25¢?

6. A motor boat was 20 ft. long, 4 ft. wide, and 20 in. deep. A boat on the same model 16 ft. long should be how wide? How deep?

7. A boat on the same model 24 ft. long should be how wide? How deep?

8. In cooking Quaker Oats, use $2\frac{1}{4}$ cups of water for

1 cup of oats. How much water should be used for 1½ cups of oats? For 2½ cups?

a. To make apple snow for 8 persons, use 7 apples, 5¢, ⅓ cup of sugar, 1¢, and 5 egg whites @ ½ of 36¢ per dozen. How much do the ingredients cost? How much for each person?

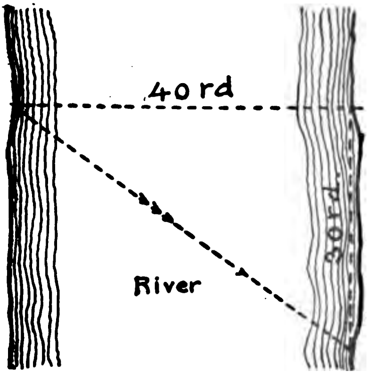
b. How much of each ingredient should be used to make apple snow for 12 persons? How much should the material cost?

CCXIV. REVIEW

1. What is the ratio of the volume of a cylinder to that of a cone of the same base and altitude?

2. What is the ratio of the convex surface of a cone to that of a cylinder of the same diameter with an altitude equal to the slant height of the cone?

3. What is the ratio of the surface of a sphere to the convex surface of a cylinder of the same diameter with an altitude equal to the diameter?



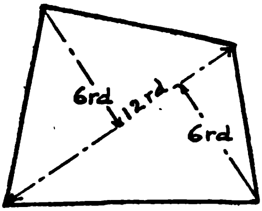
4. In going across a river 40 rd. wide, a boat was carried 30 rd. down-stream by the current. How many rods did it actually move?

5. Allowing 1¼ cu. ft. to a bushel, how many bushels of corn will a bin 3 ft. by 5 ft. by 2 ft. hold?

6. When it is 6 A.M. at Greenwich, England, what time is it at New York?

7. Find the area of a circle 1 ft. in diameter.

8. Find the volume of a cylinder 1 ft. in diameter and 1 ft. high.



9. Find the volume of a cone 1 ft. in diameter and 1 ft high.

10. Of a sphere 1 ft. in diameter.

a. Find the area of this lot by finding the areas of the triangles into which it is divided.

b. How many acres in ¼ section?

CCXV. REVIEW

1. To make divinity fudge, use 3 cups of sugar, 1 cup of Karo corn, ½ cup of water, the whites of 2 eggs, 1 cup of chopped nuts, and a teaspoonful of vanila. How much of each ingredient should be used to make 1½ times this quantity?

2. A building is 42 ft. by 60 ft., with walls 24 ft. high, and roof 12 ft. high projecting 4 ft. beyond the walls. Give the corresponding dimensions for a building 28 ft. wide having the same proportions.

3. For 2 qt. of ice-cream use 1½ pt. of cream, 1½ pt. of milk, 1 cup of sugar, the juice from 1 box of raspberries, and a few drops of extract of lemon. How much of each ingredient is required for 3 qt. of cream?

4. A cylindrical silo is 21 ft. in diameter and 30 ft. deep. How deep will one of the same shape 14 ft. in diameter be?

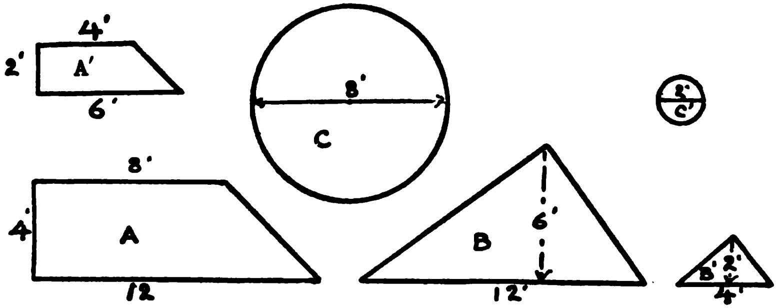
5. How many square feet in the floor of a hall 55 ft. square?

6. The hypothenuse of a right-angled triangle is 60 ft. long, and another side is 48 ft. long. How long is the third side?

a. A bin 5 ft. by 4 ft. by 3 ft. will hold about how many measured bushels (1¼ cu. ft.) of corn?

b. It would hold about how many bushels of potatoes?

CCXVI. AREAS OF SIMILAR SURFACES



1. How do *A* and *A′* compare in shape?

2. What does the ratio of the altitude of *A* to that of *A′* equal?

3. What does the ratio between the upper parallel sides equal?

4. The ratio between the lower parallel sides?

5. What does the ratio of the area of *A* to that of *A′* equal? What power of 2 is 4?

6. How do *B* and *B′* compare in shape?

7. The ratio of the altitude of *B* to that of *B′* equals what?

8. What does the ratio of the base of *B* to that of *B′* equal?

9. What does the ratio of the area of *B* to that of *B′* equal? What power of 3 is 9?

10. How do *C* and *C′* compare in shape?

11. What does the ratio of the diameter of *C* to that of *C′* equal?

12. What does the ratio of the circumference of *C* to that of *C′* equal?

13. What does the ratio of the area of *C* to that of *C′* equal? What power of 4 is 16?

The area of any surface equals the area of a similar surface multiplied by the square of the ratio of any line of the first to the corresponding line of the second.

14. The ratio of the radius of one circle to that of another equals 10. The square of 10 equals what? The area of the first equals how many times that of the second?

15. A quarter circle contains 8 sq. ft. How many square feet will a quarter circle whose radius is 10 times as great, contain?

16. A quarter circle of half this radius has what area?

17. Radius $A \div$ Radius $A' = \frac{1}{2}$. Area $A \div$ Area $A' = x$

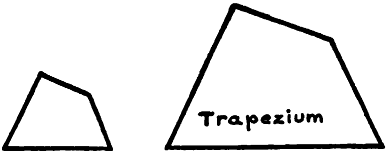
CCXVII. AREAS OF SIMILAR SURFACES

1. The ratio of the width of a parallelogram to that of a similar parallelogram equals $\frac{1}{2}$. The square of this ratio equals what? The area of the first is what part of that of the second?

2. A side of a square field equals $\frac{1}{4}$ of the side of another square field. Its area is what part as great?

3. A side of a floor equals $\frac{1}{3}$ of the corresponding side of a similar floor. Its area is what part as great?

4. A side of a trapezium equals $\frac{1}{2}$ of the corresponding side of a similar trapezium. Its area equals what part of that of a similar trapezium?

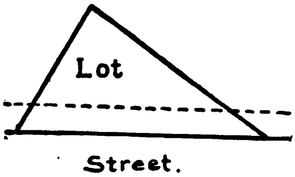


5. A sail 8 ft. high contains 20 sq. yd. of cloth. One of the same shape 16 ft. high contains how many square yards? One 24 ft. high contains how many square yards?

6. The outside surface of a boat 20 ft. long contains 160 sq. ft. What is the area of the outside surface of a boat of the same shape 60 ft. long?

7. It costs $5 to paint a boat 16 ft. long. What will it cost to paint one of the same shape 48 ft. long?

8. A circular bed 6 ft. in diameter has a flower border 1 ft. wide. The center is turfed. What part of the bed is turfed? What part is set with flowers?

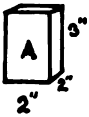


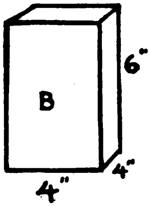
9. In widening a street to a line parallel with the original street line a triangular lot containing 8000 sq. ft. had its street line reduced to $\frac{3}{4}$ of its original length. What part of its area remained?

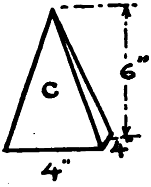
10. What part was taken for the street? How many feet?

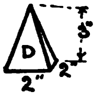
11. At 10¢ a square foot, how much would the owner receive from the city?

CCXVIII. VOLUMES OF SIMILAR SOLIDS









1. How do the prisms *A* and *B* compare in shape?

2. The ratio of the width of *B* to that of *A* equals what?

3. The ratio of the altitude of *B* to *A* equals what?

4. The ratio of the volume of *B* to that of *A* equals what? What power of 2 is 8?

5. How do the pyramids *C* and *D* compare in shape?

6. The ratio of a side of the base of *D* to a side of the base of *C* equals what?

7. The ratio of the altitude of D to that of C equals what?

8. The ratio of the volume of D to that of C equals what? What power of $\frac{1}{2}$ is $\frac{1}{8}$?

The volume of any solid equals the volume of a similar solid multiplied by the cube of the ratio of any line of the first to the corresponding line of the second.

CCXIX. VOLUMES OF SIMILAR SOLIDS

1. The diameter of a sphere equals twice the diameter of another sphere. The volume of the first compares how with that of the second?

2. The height of a cone is 3 times that of a similar cone. The volume of the first compares how with that of the second?

3. The volume of a cone 15 in. high, is 270 cu. in. What is the volume of a similar cone 5 in. high?

4. Of one 10 in. high?

5. A cylindrical pail 4 in. in diameter will hold 150 cu. in. of water. How much will a pail of similar shape 8 in. in diameter hold?

6. How much will one of a similar shape 12 in. in diameter hold?

7. Find the volume of a cylinder 2 ft. in diameter and 2 ft. high.

8. Of a similar one 4 ft. in diameter.

Find this in the easiest way.

a. Of a cone 2 in. in diameter and 2 in. high.

b. Of a similar cone 4 in. in diameter.

c. Of a sphere 2 in. in diameter.

d Of a sphere 4 in. in diameter.

e. Of a sphere 8 in. in diameter.

f. Of one 1 in. in diameter.

CCXX. REVIEW

1. The area of the entire surface of a cylinder is 31$\frac{3}{7}$ sq. in. Find the area of a similar cylinder of twice the diameter.

2. John D. Rockefeller had $5000 in 1865, and $25,000 in 1870. What was the per cent of the increase?

3. A man works from 7.30 A.M. to noon, and from 1 to 5.30 P.M. @ 16$\frac{2}{3}$¢ an hour. How much does he earn?

4. A bushel of tomatoes costing 90¢ fills 18 quart jars. How much is the cost per jar?

5. A basket of peaches, $1.00, and 7 lb. of sugar, 45¢, will make 11 quart jars of peach. How much is the cost per quart?

6. To make clam chowder for 12 persons, use 1 qt. of clams, 20¢, 3 cups (half pints) of milk @ 8¢ a quart, $\frac{1}{4}$ lb. of pork @ 20¢, 1 qt. of potatoes, 3¢, 2 onions, 1¢. How much do the ingredients cost? How much for each person?

7. Find the cost of 8 lb. 3 oz. of lamb @ 20¢.

8. When Venus is 22° above the horizon, how far is it from the zenith.

9. How many strips of carpeting 27 in. wide are required for a room 21 ft. wide?

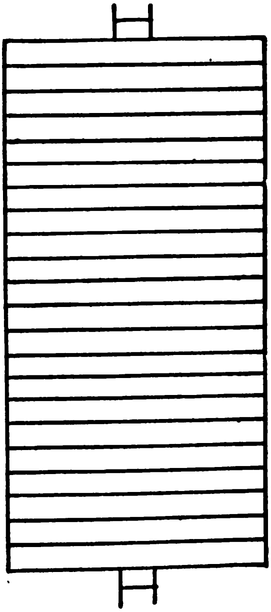
10. How many square yards in a rug 7$\frac{1}{2}$ ft. wide and 12 ft. long?

a. How many square yards in a rug 10$\frac{1}{2}$ ft. wide and 16 ft. long?

b. How many fence posts 8$\frac{1}{4}$ ft. apart are required for a piece of fence 40 rd. long?

c. How many fence posts 8$\frac{1}{4}$ ft. apart are required for a fence round a lot 10 rd. square?

CCXXI. REVIEW—DRAWING TO SCALE



1. The field of play for football is a **rectangle 330 ft. long and 160 ft. wide**, and is marked off on the ground by heavy white lines. On a scale of $\frac{1}{16}$ in. to 1 yd., how long a line will represent a side of the field?

2. How long a line will represent one end of the field?

3. Draw the perimeter of the field to this scale.

4. How many yards in half of the length of the field? Half of a **side-line** measures how many inches on your diagram?

5. Divide the field of play into halves by a line from the middle of one side-line to the middle of the other.

6. The end-lines of the field are called the **goal-lines.** The field is marked off at intervals of 5 yd. by white lines on the ground parallel to the goal-lines. How far apart should these lines be drawn upon the diagram?

7. Draw these 5-yard lines.

8. Along one side-line mark the number of yards of each 5-yard line from the nearer goal-line.

9. There is a **goal** in the **middle of each goal-line.** It consists of **two upright posts** exceeding 20 ft. in height, and placed 18 ft. 6 in. apart, with a **horizontal cross-bar** 10 ft. from the ground. How many feet of the goal-line are not occupied by the goal? How many feet on each side of the goal?

10. Think of the goal-posts and cross-bar as having

fallen outward from the field and lying in a horizontal position, and represent them in the diagram in this position.

a. If the football field were drawn to scale, $\frac{1}{10}$ in. to 1 yd., how long would the side-lines measure in the drawing?

b. How long would the goal-lines measure? What would the distance between the 5-yard lines measure?

c. If the field were drawn to scale, $\frac{1}{8}$ in. to 5 yd., how long would the side-lines measure in the drawing? How long would the goal-lines measure? How long would the distance from the 45th yard line to the goal measure.

CCXXII. REVIEW

1. Estimate the length of a full line of the printed matter upon this page. Test the estimate with the rule.

2. If a line of typewritten matter 6 in. long makes a line of this page, how long a line of typewritten matter will make a line of the printed matter 3 in. long? How long a line of the typewritten matter will make a line of the printed matter $1\frac{1}{2}$ in. long?

3. A line $3\frac{1}{2}$ in. long? A line $1\frac{1}{4}$ in. long? A line $2\frac{1}{4}$ in. long? A line $2\frac{3}{4}$ in. long?

4. A line $3\frac{1}{4}$ in. long? A line $3\frac{3}{4}$ in. long? $1\frac{3}{4}$ in. long?

5. A cylindrical salt box is $3\frac{1}{2}$ in. in diameter inside, and 5 in. deep. Find the circumference of the box. The area of the base.

6. Find the volume of the box.

7. Find the volume of a cornucopia having the same diameter and altitude as the box.

a. Of a sphere of the same diameter.

b. An even quart, dry measure, equals about 67 cu. in. The cornucopia holds approximately what part of a quart?

c. The salt box holds approximately what part of a quart?

d. The area of the base of a cylindrical box having the same shape as the salt box and twice its diameter equals how many times that of the salt box? How much is it?

e. Its volume equals how many times that of the salt box? How much is it?

CCXXIII. REVIEW

1. How much postage is required for a registered package containing eye-glasses and weighing 4 oz.?

2. For a magazine weighing 4 oz.?

3. For a book weighing 4 oz.?

4. How many cords in a pile of wood 4 ft. by 6 ft. by 10 ft.?

5. Find the cost of 6 lb. 3 oz. of sirloin roast @ 30¢.

6. Of 2200 lb. of coal @ $6.50.

7. Of 1950 lb. of hay @ $24 per ton.

8. Find the cost of 50 civics books @ 50¢ less 20%.

9. About how many measured bushels of corn will a bin 5 ft. by 10 ft. by 10 ft. hold? See table of dry measure.

10. How many bushels of apples would this bin hold?

a. Approximately how many gallons would a tank of the same dimensions hold?

b. Find the circumference of a cylindrical tank 70 ft. in diameter.

c. Find the area of its base.

To find 17½ times a number, find 10 times the number, ½ of 10 times the number, and ½ of ½ of 10 times the number.

d. Find how many cubic feet it will contain if it is 10 ft. deep?

e. Find the volume of a similar tank of half the dimensions.

CCXXIV. REVIEW

1. How many acres in a field in the form of a trapezoid whose parallel sides are 40 rd. and 60 rd. long, and 20 rd. apart?

2. Find the proceeds of a note for $200 for 2 m. discounted at a bank at date.

3. March 21, $40 is deposited in a savings bank. When will it begin to bear interest? When will the first interest be added to the principal? How much is the interest? How much is the new principal?

4. On a note dated Jan. 4 for $100 with interest @ 6%, $60 was paid March 4. How much was the balance?

5. Find the proceeds of 200 bl. of potatoes sold @ $5 on commission of 5%, with freight expense of $1 per barrel.

6. The area of a triangular field is 3A. What is the area of another triangular field of the same shape whose corresponding sides are each $\frac{1}{2}$ as great as those of the first?

7. If it costs $10 to paint a boat 20 ft. long, how much should it cost to paint a boat 50 ft. long built on the same model?

8. If a cylindrical tank 6 ft. in diameter will hold 800 gal., how many gallons will a similar tank 18 ft. in diameter hold?

a. How much will a similar tank 3 ft. in diameter hold?

b. How much will a similar tank 12 ft. in diameter hold?

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